AGRICULTURAL *Chemicals*

IN THIS ISSUE:

FEBRUARY, 1957

There's a Fungus Among Us

CONTAMINATED COTTON

Verdict:

Joe Grower found GUILTY as charged . . . guilty of allowing his cotton to become infected with damping-off because he neglected to treat his soil with TERRACLOR. This new Olin Mathieson fungicide for certain soil-borne diseases is available as 10%, 20%, and 40% dust . . . 75% wettable powder . . . 2 lb. emulsifiable. Joe Grower's neglect is inexcusable since often one application of TERRACLOR is effective from planting time to crop maturity.

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AGRICULTURAL *Chemicals*

This Month's Cover

New officers of the Northeastern Weed Control Conference (see story on page 33). Seated: retiring president L. L. Danielson; new president C. L. Hovey; and vice president S. F. Fertig. Standing: secretary R. J. Aldrich; and treasurer D. A. Schallock.

Vol. 12, No. 2 **February, 1957**

AGRICULTURAL *Chemicals*

ARTICLES

FEATURES

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In the Spotlight this Month

- **Sampling Materials** . . . A review of equipment for the sampling room, and comparision of uniformity of samples drawn with different instruments. Page 45.

- **Agricultural Aviation** . . . Marsh Aviation, Phoenix, reports on the set-up of its organization, and discusses problems of the aerial applicator. Page 43.

- **Drying and Cooling Fertilizers** . . . Discussion of the removal of moisture from granular fertilizers by several methods; effects of temperature, humidity, air velocity, retention time, flight arrangement and inclination. Drying in a counter current flow dryer and a con-current straight tube. Page 30.

- **Selective Insecticides** . . . The selective approach to insect control appears to be the most promising, suggests W. E. Ripper, who further explains that despite a higher initial cost per acre, the cure is more permanent. An approach to pest control which deserves consideration in view of increasing losses, and the ever increasing outlay for higher and higher applications of pesticides. Page 36.

- **Continuous Fertilizer Granulation** . . . Davison's Trenton processes is characterized by an ability to conform to many types of formulation practices. The complete liquid phase is controlled by means of recycle control, to achieve a non-slurry condition, and still achieve a satisfactory penetration of the liquids into the solids. Page 41.

- **New Herbicides** . . . EPTC, Mylone and Simazin cited as most interesting new herbicides in 1956. EPTC effective only if applied to weeds before emergence; Mylone—a solid — has shown promise on annual and perennial weeds, certain nemotodes, soil fungi and soil insects. Page 33.

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INDUSTRY MEETING CALENDAR

Jan. 28-Feb. 1—Pest Control Operator's Conf., Purdue University, Lafayette, Ind.

Feb. 4-6—Cotton States Branch, Entomological Society of America, Birmingham, Ala.

Feb. 14-15—Midwinter joint meeting of fertilizer manufacturers and the state college agronomists. Edgewater Beach Hotel, Chicago.

Feb. 17-19—National Garden Supply Show, New York Coliseum, New York City.

FFeb. 13-15—Midwest Shade Tree Conference, Pfister Hotel, Milwaukee.

Feb. 19-20—Alabama Pest Control Conference, and Alabama Association for Control of Economic Pests, Auburn, Alabama.

Feb. 27-28—Indiana-Ohio Agricultural Aviation Conf., 6th annual meeting, Purdue University, Union Building, Lafayette, Ind.

Mar. 4-5—Western Cotton Production Conference, Hotel Westward Ho, Phoenix, Arizona

Mar. 6-8—National Agricultural Chemicals Association, Fairmont Hotel, San Francisco

Mar. 11-12—Southwestern ESA, Gunter Hotel, San Antonio, Tex.

Mar. 27-29—North Central Branch, Entomological Society of America, 12th annual meeting, Des Moines, Iowa.

April 2—Western Agricultural Chemicals Association, spring meeting, Hotel Biltmore, Los Angeles.

April 14-15—California Fertilizer Conference, fifth annual meeting, Fresno State College, Fresno, Calif.

May 20-22—Chemical Specialties Manufacturers Association, Drake Hotel, Chicago

June 9-12—National Plant Food Institute, The Greenbrier, White Sulphur Springs, W. Virginia

June 17-19—Association of Southern Feed and Fertilizer Control Officials, 15th annual convention, Dinkler-Tutwiler Hotel, Birmingham, Alabama.

June 26-28—American Society of Agricultural Engineers, Michigan State University, East Lansing, Mich.

June 26-28—Fertilizer Conference of the Pacific Northwest, Benson Hotel, Portland, Ore.

July 17-19—Southwestern Fertilizer Conference and Grade Hearing, Galvez Hotel, Galveston, Texas.

Sept. 8-15 — International Congress of Crop Protection, fourth international meeting. Hamburg, Germany.

Oct. 2-4—Beltwide Cotton Mechanization Conference. Shreveport, La.

November — Entomological Society of America, annual meeting to be held about the 3rd week of November. Dates not yet announced. Hotel Peabody, Memphis, Tenn.

Dec. 9-12 — Chemical Specialties Manufacturers Association, Hollywood Beach Hotel, Hollywood, Fla.

TRADE LISTING

National Agricultural Chemicals Association, Association Building, 1145 19th St., N.W., Washington, D. C. Lea Hitchner, executive secretary.

National Plant Food Institute, 1700 K St., N. W., Washington, D. C. Paul Truitt and Russell Coleman executive vice-presidents.

American Phytopathological Society, S. E. A. McCallan, secretary, Boyce Thompson Institute, Yonkers, N. Y.

American Chemical Society, 1155 16th St., N. W., Washington, D. C.

Association of Official Agricultural Chemists, P. O. Box 540, Benjamin Franklin Station, Washington, D. C., William Horwitz, secretary-treasurer.

Agricultural Ammonia Institute, Hotel Claridge, Room 305, Memphis, Tenn., Jack Criswell, executive vice president.

American Society of Agricultural Engineers, F. B. Lanham, secretary, 505 Pleasant St., St. Joseph, Mo.

Carolinas-Virginia Formulators Association, 516 S. Salisbury St., Raleigh, N. C. J. B. Maddrey, executive secretary.

California Fertilizer Association, Sidney Bierly ,executive secretary, Suite 1, Boothe Building, 475 Huntington Drive, San Marino, California.

Chemical Specialty Manufacturers' Association, 110 East 42nd St., New York City, Dr. H. W. Hamilton, secretary.

Entomological Society of America, 1530 P. Street N. W., Washington, D. C., R. H. Nelson, secretary.

Mid-West Soil Improvement Committee, 121 West Wacker Drive, Chicago 1, Ill. Z. H. Beers, executive-secretary.

National Nitrogen Solutions Association, 2217 Tribune Tower, Chicago, Ill. M. F. Collie, secretary.

National Cotton Council, PO Box 9905, Memphis, Tenn.

Weed Society of America, W. C. Shaw, secretary, Field Crops Research Branch, Beltsville, Md.

Western Agricultural Chemicals Association. Charles Barnard, executive secretary, 2466 Kenwood Ave., San Jose, Calif.

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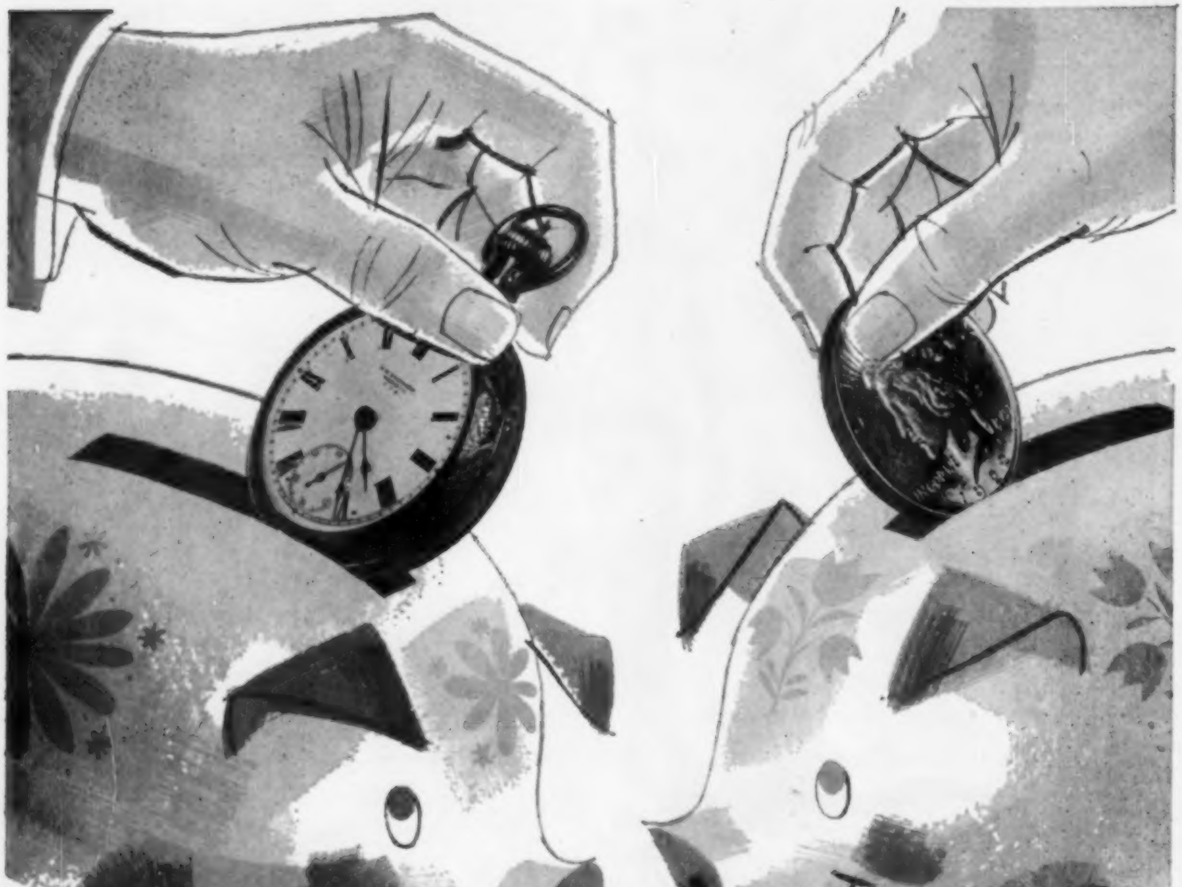

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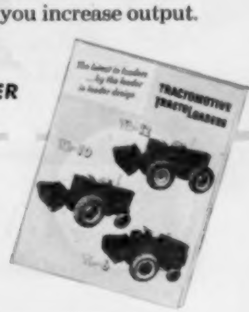

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Editorial COMMENTS

THE fertilizer industry made a strong case before the Interstate Commerce Commission in opposing the proposed increases in freight rates. Its discussion of the merits of the situation can definitely be considered to have been successful, for, while increases were granted, they were not as large as the railroads had sought, and definite ceilings were set on shipments of basic, big-volume raw materials such as phosphate rock and potash.

The strongest part of the industry's case, to our minds, lay in its emphasis on the fact that fertilizer materials, which move in heavy volume over long distances, help generate much needed and highly profitable bulk traffic for the railroads, not alone in the fertilizer raw materials themselves but secondarily through the movement of higher volumes of farm commodities produced through the aid of fertilizer.

The price increases which have been approved obviously cannot be absorbed by the fertilizer industry, whose profit margins are already extremely low. They must of necessity be passed along to the farmer, and in the end the higher rates may be self defeating, for they may reduce the volume of a traffic which has been profitable for the railroads.

To get to the heart of the railroad rate situation would require a basic change in thinking, and a return to some harsh economic facts, which perhaps is too much to expect of any governmental agency. The facts are, as most everyone knows, that the railroads make billions out of carrying freight, including fertilizers and fertilizer raw materials. They regularly lose billions on passenger traffic. If by raising rates on their profitable traffic higher, they succeed in losing some of this traffic, or diverting it to other carriers, including steamers bringing imported potash into the U. S., they will only aggravate their present situation.

* * * * *

RESEARCH in the agricultural chemical field can sometimes be rather disheartening. It is not enough to discover a new product that represents a useful advance, or a new way of using an old product. Even after the new product has proved itself to the experts, it is still often a major task to sell it to the farmer.

A typical example of just such a situation is currently being faced in the herbicide field. Many of the most promising new materials being developed for weed control are designed for use before weeds emerge. They work fine, but the weed control experts tell us it is practically impossible to get the farmers to buy or use them. The average farmer simply refuses to think of control measures until he can actually see the weeds.

Insecticide formulators attempting to sell higher than normal concentrations of insecticides are encountering a similar negative reaction on the part of users. Seventy-five per cent DDT may be a step forward, designed to save money, effort and application time, but the farmer is used to gauging value on the basis of volume, and he won't pay the higher price

(Continued on Page 97)

Fundamentals of DRYING & COOLING

DRYING of fertilizer is done to facilitate and speed up the process of manufacture and to preserve the material in its final stage. But whatever the reasons for drying, the performance of the drying equipment may be the keystone on which depends the success or failure of your granular fertilizer plant. There are various forms of dryers on the market, any one of which may possess advantages over others when operating under definite conditions. This report deals only with the more important types of dryers employed in the drying of granular fertilizers.

An interchange of heat is necessary in all fertilizer drying operations. Heat is required to warm up the fertilizer undergoing treatment and to evaporate the moisture. Air is the medium generally employed for conveying heat to the material because first, it can operate on each particle directly; second, it readily lends itself to accurate control; and thirdly, it provides a convenient means of carrying away the evaporated water. When passing thru the dryer the air gives up the necessary amount of heat for heating and evaporating the water, and in so doing suffers a fall in temperature. It must, however, leave the dryer at a sufficiently high temperature to enable it to retain its water vapor, without the danger of reaching the saturation point. In practice it is seldom allowed to exceed 50 to 75% saturation at the exit of the dryer. For the drying process to continue, the air must be removed continually, *and the quicker it is removed, the more rapid is the rate of drying.*

The temperature to which the air may be heated at entry to the dryer will depend mainly on the nature of the grade of fertilizer being treated, its initial moisture content, the extent to which it is desired to reduce the moisture and the amount of heat of reaction. If the last traces of moisture are to be removed, the fertilizer will gradually rise in temperature and, in the case of countercurrent dryers, the material may have to be heated almost to the temperature of the entering air, in which event, the air may only be heated to the highest temperature which the fertilizer can stand without injury. If, however, the fertilizer may still retain a certain amount of moisture in its dried state, it will not be necessary to raise its temperature to that of the incoming air, and accordingly the air may be admitted to the dryer at a higher temperature, as in the case of parallel flow drying. As a general rule, it may be stated that the higher the temperature of the incoming hot air compatible with the grade of the fertilizer being dried, the more efficient will be the dryer.

The amount of water to be removed varies considerably with different grades of fertilizer. Some wet mixes may have a water content of 14%, or it may be as low as 4%. As for the final moisture content, most grades are considered dry at 1½% of water, or even higher. The initial and final water content have an important influence upon the time and cost of drying.

When wet ammoniated fertilizer starts to dry, the moisture in the outer

Presented at the Fertilizer Industry Round Table, October 16 to 18, 1956, Shoreham Hotel, Washington, . C.

by Elmer J. Leister
Edw. Renneburg & Sons Co.
Baltimore, Maryland

layers moves to the surface, where it is removed by evaporation. Since the moisture content of the outer layers is being reduced, a general diffusion toward the surface is set up from the relatively wet to the relatively dry portions, and this diffusion extends gradually into the interior of the body of each fertilizer granule. The rate of this movement (diffusion) depends on *the rate of evaporation, the temperature of the material, its texture and structure, its water content, and the way in which the moisture occurs throughout the material.*

It is quite evident that the drying of granular fertilizer really involves two simultaneous processes, namely (1) evaporation at or near the surface of the granule and (2), diffusion of the moisture to the surface of evaporation. Evaporation or drying will therefore be limited by the rate at which the moisture can diffuse to the surface. But with the diminishing water content, the rate of diffusion, and hence also rate of evaporation is slowed down.

Gas or oil direct fired rotary fertilizer dryers will evaporate from 2 to 6 pounds of water per cubic foot of dryer volume. Evaporation capacity increases to some extent with increasing moisture content of the fertilzer feed and with increasing allowable moisture content of the final product.

Temperature

HEAT increases the rate of evaporation as well as the diffusion of moisture to the surface. An upper limit to the temperature which may be employed is set by the formulation and the grade of fertilizer. The higher the amount of water a grade of fertilizer contains, the higher the drying air temperatures may be.

A certain quantity of heat has to be supplied to the dryer per hour to dry a given tonnage. That heat employed usefully goes to evaporate the moisture in the goods. In a plant showing a low thermal efficiency, this portion of heat usefully employed may be only a small fraction of the total heat supplied. The rest is lost by radiation, high exhaust air temperature, air leaks, in heating up the fertilizer, in transporting equipment, and in the entire drying system itself. The thermal efficiency of a dryer is measured by the ratio of heat required to evaporate the moisture from the material, to the total heat supplied.

Humidity

THE amount of moisture in the air influences not only the drying rate, but also the extent to which the fertilizer will dry. At each temperature and pressure a cubic foot of air is capable of holding a definite maximum quantity of water in the form of vapor. In this condition the air is said to be saturated, or to possess a degree of saturation or a relative humidity of 100%. If this same cubic foot of air contains less vapor, as for instance only ¾ or ¼ of the saturation amount, at the same temperature and pressure, these conditions are expressed by saying that it has a relative humidity of 75% or 25% respectively. In the first case, the air would be "moist," in the last case "dry."

It is important to note that raising the temperature of moist air, lowers its relative humidity. Thus air at 75% humidity and at 60 degrees F. has a relative humidity of only 11% when raised to 120 degrees F. Drying cannot, of course, take place in already saturated air. Reducing the degree of saturation of the drying air increases the rate of drying.

During the first stages of drying, the temperature of the material is approximately at the wet bulb temperature of the surrounding air (well below the boiling point of water). As drying proceeds, fertilizer temperature gradually rises, and towards the discharge end approaches that of the drying air temperature. This is an important practical point when dealing with grades of material which have an upper temperature limit which cannot be passed without causing injury to the material. This point must also be considered very seriously when drying in a counter-current flow dryer.

Air Velocity

THE rate of evaporation is increased by an increase in the velocity of the air passing over the surfaces of the granular material, because the rate of diffusion of the vapor lying at the surface of the fertilizer, into the surrounding air, is increased. Therefore, the amount of heat brought to each fertilizer particle in a unit time is increased also.

As stated previously, air forms a convenient vehicle for carrying heat to the wet fertilizer and for removing the vapor produced by evaporation.

Obviously, this heat so conveyed must be distributed uniformly throughout the cascading, showering fertilizer. Moreover, the vapor must be swept away effectively from all surfaces of evaporation. This clearly entails a correctly designed lifting flight system for uniform distribution and active air circulation. If the hot air takes a direct path from the furnace thru the dryer and out into the atmosphere, the internal air to material circulation is likely to be defective, and if it escapes with low humidity the thermal efficiency of the operation will be low.

Retention Time, Flight Arrangement and Inclination

ROTARY dryers usually run with 10 to 15% of their volume filled with fertilizer, and under these conditions the dryer usually can be made

to hold the material long enough to accomplish the removal of internal moisture. If the holdup or retention in the dryer is not great enough, the time of passage thru the dryer may be too short to achieve the desired degree of removal of internal moisture, and its capacity will be less than it should be. Time of passage is defined as holdup divided by feed rate.

The slope of rotary dryer shells varies from 0 to ¼" per ft. The slope is adjusted usually to give a holdup of 15% after the diameter, length and speed of rotation have been fixed. In some cases of parallel flow operation, negative slopes have been used.

The direct rotary dryer is usually equipped with flights on the interior surface of the shell for lifting and showering the wet material thru the hot gases during passage through the cylinder. These flights may be extended continuously through the entire length of the dryer, or rows of them may be offset or staggered every 3 to 4 ft. The slope of the flights depends upon the handling characteristics of the fertilizer. For free-flowing granular material, a radial flight with as much as a 90 degree lip is used. For sticky materials, a straight radial flight without any lip is used. Intermediate types have been designed to give maximum showering action of the fertilizer as it passes from feed to discharge during rotation of the dryer unit. In other words, when the fertilizer changes characteristics during drying, the flight design is changed along the dryer length. Spiral flights are used for the first few feet at the feed end of the dryer to accentuate a forward motion of the fertilizer into the dryer before normal flight action begins. When parallel air flow is used, flights are often left out of the last few feet of the dryer to prevent excessive dust carryover in the exhaust gases.

Parallel and Counter Flow Drying and Cooling

WHEN the fertilizer travels thru the dryer parallel with the drying air, there is a rise in material temperature from the feed end to the discharge end. If the air is to be exhausted at the highest humidity possible, then the drying of the product as it approaches the discharge end will be retarded, whereas this is the region in which it should be accelerated. If the humidity of the exhaust air is reduced in order to speed up drying, the thermal efficiency of the drying process will be lowered.

A favorable feature of the parallel flow dryer is the relatively small

(Continued on Page 105)

MORE COMMENTS ON DRYING

by G. T. Nielsson

International Minerals & Chemical Corp.

THE fertilizer industry generally is a large volume producer of a low cost material. Therefore processing and equipment costs must be kept low. With the advent of granulation, a series of manufacturing steps has been added to the process that cannot but help increase the cost of manufacture. Of course we hope that in most grades, reduced costs of new raw materials will help overcome the additional processing cost. The most expensive ingredient in the fertilizer formula is nitrogen, and the cheaper forms of nitrogen have poor physical condition in that they tend to absorb moisture from the air and result in caked products. Caking can occur from the purely physical phenomenon of compression of moist material into solid lumps. It can occur also from the chemical reactions between ingredients that result in new crystal formation with added bonding area.

However, both types of caking begin at a given moisture level, and caking accelerates as the moisture content of the product increases.

I believe that low moisture is the ultimate answer to the caking problem. Powdered fertilizer will not cake at low enough moisture contents, and granular material will cake if the moisture is high enough.

Of course each grade and formulation require a given moisture content for freedom from caking. But for high nitrogen goods like 12-12-12 or 10-10-10, good condition can be had if the moisture is 1% or less, while in low nitrogen goods like 4-16-16, 5-20-20, or 5-10-10 a moisture content of about 1.5 to 2.0% usually is satisfactory.

To reach moistures of from 1 to 2%, with low cost materials I believe artificial drying is necessary, and the drier becomes the most important piece of equipment in the granulating process if we consider physical condition as of utmost importance.

The rotary drier is the simplest piece of equipment for lowering the moisture content of fertilizer materials. It consists of a cylindrical chamber rotating on its horizontal axis with the discharge end slightly lower than the feed end. Because contamination is not a problem, flue gases are led directly through the cylinder, and very rapid evaporation of water is realized. Lifting plates, or shelves are fastened usually to the inside of the cylinder running the length of and parallel to the axis of the cylinder. The rotation of the cylinder continually elevates the material and throws it through the current of hot gas, and the inclination of the shell moves the charge forward.

Usually the drier is a single shell, supported on steel tires that rest on rollers held in suitable bearings. It is driven by a gear fastened to the shell which engages a pinion keyed to a driving shaft.

We have a choice of passing the hot gas in a direction opposite to the passage of the charge, (counter-flow or counter current,) or passing the hot gas in the same direction as the charge, (parallel flow or concurrent.)

You have heard of the advantages of counter current drying in a straight tube and of parallel flow drying in a DehydrO-Mat.

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... New Herbicides Highlight NE Weed Control Conference

EPTC, a new chemical for pre-emergence and post-emergence grass and broad-leaf weed control, shared the spotlight with several other promising new herbicides on the program at the North East Weed Control Conference held January 10-12 at the Sheraton-McAlpin Hotel, New York City. C. L. Hovey of the Eastern States' Farmers Exchange, was elected president at the three day meeting, to succeed L. Danielson, Virginia Truck Experiment Station. S. N. Fertig, Cornell University, was elected vice president. R. J. Aldrich, and D. A. Schallock, both of Rutgers University were re-elected secretary and treasurer.

The new experimental herbicide (ethyl N,N - di - n - propylthiolcarbamate) was described in a report by J. Antongnini, H. M. Day, and Harry Tiles, Stauffer Chemical Co. EPTC has been tested in the greenhouse and field during the past two years, under a variety of conditions, and when applied prior to weed emergence has given excellent control of all grassy weeds against which it has been tested including many major broadleaf weeds such as red-root pigweed and purslane.

Mr. Antognini emphasized that the new chemical is effective *only* if applied before the weeds emerge. It is non phytotoxic to weeds or crops after emergence. He said that EPTC has given excellent weed control for the entire growing period of crops such as corn. Results to date have shown that this extended period of weed control is due to the downward movement of EPTC in the soil, rather than to an active concentration remaining on the soil surface.

Discussing some of the promising new herbicides, Richard Aldrich, Rutgers Univ., announced that the most outstanding and interesting material by far in 1956 was Simazin (2-chloro-4,6 bis (ethyl amino-triazine)) which he reported is extremely promising for pre-emergence weed control in corn. In a later report, by Robert A. Peters, University of Connecticut, similar comments concerning Simazin were made. Mr. Peters observed there was no visible damage to corn from applications of Simazin at rates up to eight pounds per acre.

Mr. Aldrich indicated that Dalapon was good on quack grass, but that fall treatments are safer in plots where corn is to be planted. Dalapon and 2,4-DB gave excellent results on all annual weeds and in legume seeds. ATA (3-amino-1,2,4 triazole) is selective on cranberries and in control of specific weeds, including canada thistle, milkweed, poison ivy, and cattails.

CDAA (Randex) is not too promising when used alone in preemergent treatments on corn; however, it gives good results when used in combination with TBA. CDEC (Vegedex) has been found good on cole crops and in premerge treatments of table beets and nursery stocks. 2,4DB (butyric derivative of 2,4-D) does not damage alfalfa and is specific in weed control. MCPB which is selective on legumes, is a little more damaging to alfalfa than 2,4DB.

Mr. Aldrich reported that disodium methyl arsonate (Crab-E-Rad) is as good as some of the older materials for weed control, and is worthy of further consideration. He concluded with comments on Neburon and Vapam, indicating that Neburon is effective on crabgrass if several treatments are made . . . but that it has little effect in a single treatment.

S. F. Fertig (left) presents Carlton O. Cartwright with the Extension Award for outstanding extension work in weed control for fruit and vegetable growers, nurserymen and dairymen.

Dr. R. A. Peters, right, of the Plant Science Department of the University of Connecticut, is shown receiving an award for an outstanding paper prepared by himself and A. J. Kerkin.

W. C. Bramble, Penn State Univ. is shown receiving an award for an outstanding paper from J. D. Van Geluwe. W. R. Byrnes, and D. P. Worley also received awards.

Weed Control in Corn

W. H. Lachman and L. F. Michelson, Massachusetts Agricultural Experiment Station, advise that reaction to Dinitro and 2,4-D treatments in 1956 experimental work was about the same as in former years. For several years, they said, TCB has appeared very promising as a herbicide for corn. Emid and CDEC also performed favorably in 1956. When 3Y9 was used at 10 pounds per acre, results were good, and the mixture of Karmex W and 2,4-D is promising and should be tried.

M. F. Trevett and R. Burnham, University of Maine, confirmed excellent results using 4.5 pounds Dinitro at emergence of sweet corn, and 4 pounds of Simazin applied at planting. DN added to CDEC sprays, they said, improved broadleaf weed control, but did not increase annual grass control, leading to the conclusion that mixtures of these two herbicides are complementary rather than additive in their action.

Treatments of 2,4-D acetamide, 2,3,6-TBA and 2,3,6-TBA plus CDAA were highly satisfactory in controlling weeds in corn when applied after the last cultivation, according to H. A. Collins and R. J. Aldrich, New Jersey Agricultural Experiment Station. On the other hand, they said that in a test designed to measure nitrogen benefits, biuret at 40 or more pounds of nitrogen per acre resulted in significant reduction in corn yield. Ammonium nitrate at 50 pounds of nitrogen equivalent, plus 2,4-D and FAB, gave highly satisfactory broadleaf control, but was not effective in controlling grasses.

2,4-D Residues in Sprayers

Because of the sensitivity of some plants to 2,4-D, there was considerable interest in a report on residues in sprayers by O. F. Curtis, Jr., New York Agricultural Experiment Station. Mr. Curtis cautioned that ordinary washing procedures are not adequate in removing 2,4-D residues in sprayers. Where washing should have diluted residues to concentrations of 2,4-D which would be negligible, concentrations of from .4 ppm to 10 ppm were still found. This, he said, seems to result from retention of acertain amount of 2,4-D that is not immediately dispersed through the rinse water or solution, but is released gradually over a period of hours. For best results, where another material must be used in the same sprayer, Mr. Curtis suggested that the subsequent crop spray should stand in the sprayer for the shortest possible time before application. Even if the sprayer was well washed after emptying the 2,4-D spray, it should be washed again just before adding the crop spray. Still, he said, traces of 2,4-D sufficient to produce symptons on sensitive crops, may occur even after these precautions have been observed.

Discussions of herbicide application equipment were presented by S. F. Potts, N. E. Forest Experiment Station; E. G. Karvelis, Connecticut State Board of Fisheries and Game; and R. T. Harrington, N.Y.S. Conservation Department.

Field Corn

Monuron and Neburon resulted in excellent control of grass and broadleaved weeds; TBA, XTB, and ACP-M-177 resulted in excellent control of broadleaves, while ATA readily controlled the grasses. 2,4-D and Emid treatments were satisfactory, but DNBP and CDAA were unsatisfactory, as they had been in 1955 . . . From a report by J. A. Meade, W. Hurtt, and P. W. Santelmann.

Weed Control in Alfalfa

Increased alfalfa yields were obtained by treatment with 2,4-DB, the combination of Dalapon plus 2,4-DB, or Neburon, with the increase in that order, announced A. J. Kerkin and R. A. Perters, Connecticut. Increased yields of birdsfoot trefoil were obtained from the combination of Dalapon plus 2,4-DB or from Neburon. 2,4-DB was not effective, since it did not control the grasses which proved to be particularly competitive to the trefoil. MCPB showed toxicity on birdsfoot trefoil at all rates and an indication of toxicity on alfalfa at the high rates.

Discussing the control of downy chess in alfalfa, J. Vengris, Massachusetts, indicated that the best chemicals are Dalapon and CIPC, and the most practical rates are 3-6 lb/A of acid equivalent. He said that alfalfa was injured by Dalapon, especially when applied in the spring and when higher rates were used. As the growing season progresses, the injury marks disappear, and yields of second and third cuttings are not affected. Alfalfa is most injured by Monuron, 4 lb/A treatments, applied in spring. At the end of the growing season, no visible injury was observed. Monuron was not as effective as Dalapon in controlling weedy grasses.

Quackgrass Control

Quackgrass control in 1956 was much poorer than the same treatments gave in 1954 and 1955, advised S. M. Raleigh, Pennsylvania, who reported that in plots where the persistence of amino triazole was under investigation, check plots showed less quackgrass than the rows treated with the heaviest rates of amino triazole or Dalapon, where the corn was planted with the regular seeding rate.

A.M.S. Pridham, Cornell Univ., indicated that Baron at a dilution 1:10 at the rate of 100 gallons per acre was the only herbicide effective in treating mature uncut *Agropon repens* (quackgrass). The possibility of using Baron, amino triazole or Simazin as a basal spray or granular formulation in nursery stock has yet to be established. All three have been used successfully in limited tests.

90% control of a pure stand of crabgrass was obtained using PMAS, Crabgrass and Chickweed Preventer, and Methar at specified dosages, according to tests by J. R. Haun, Insect Control and Research, Inc.

Mylone, A New Herbicide

Crag Mylone, 85W, a temporary soil sterilant, is said to control most annual and perennial weeds, certain nematodes, soil fungi and soil insects. The material is a solid which can be applied dry or with water. No tolerances, temporary or other have been established under the Miller Amendment, but residues from vegetable

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COPPER NAPHTHENATE

. . . *Bringing back the fence post*

SCIENCE has long appreciated the preservative values of copper. The Mound-Builders, early and mysterious inhabitants of North America, buried cherished personal clothing and possessions in the earthen mounds from which they inherit their name. Copper shields, axes, and trinkets were included with textiles, wood, leather, and other perishable materials. It was only through the preservative action of the leaching copper salts from the metal implements that the fine specimens of wooden, cloth, and leather objects have survived their long burial.

It was by observation of these phenomena that research scientists evolved the use of copper solutions for controlling decay in wood and fabrics. They discovered that a combination of copper with an effective petroleum derivative, copper naphthenate, would yield a superior preservative for wood and textiles.

Typical of the newer wood preservatives is Triangle Copper N-80, a product of the Triangle Chemical Co., Macon, Georgia. It is basically a concentrated solution of copper naphthenate in mineral spirits, completely soluble in petroleum solvents without use of heat or special equipment. Once it has been dissolved, it will not separate from solution except by distillation.

The Triangle product contains 80% copper naphthenate (the equivalent to 8% metallic copper) and 20% petroleum solvents. In general usage either mineral spirits or No. 2 fuel oil is used as a diluent, with the latter suitable for fence posts where color and paintability are not a factor. The company does not recommend crankcase drainings because of the possibility of residues that cause "X" disease in cattle.

In addition to usage on all types of sub-flooring, millwork, sheathing, and other types of lumber, N-80 has a number of specialized agricultural uses. It is especially suited for treating fence posts, tarpaulins, rope, and burlap, and for treating clay pots in nurseries and greenhouses to prevent algae growth.

For treating fence posts, Triangle recommends the dilution of one gallon of the concentrate with 19 gallons of fuel oil or mineral spirits in an open barrel. After mixing well, the solution should be poured into a barrel that has been filled with posts, and filled to the brim. The posts, peeled and dried before treatment, should be allowed to soak for 24 hours and then turned and soaked for 24 hours more.

For lumber products, a mixture of one gallon of the concentrate to nine gallons of mineral spirits is recommended. The material should be dipped for three minutes for each inch of thickness; or spraying or brushing methods may be used. The same solution proportion of 1:9 may be used for tarpaulins, ropes, burlap, etc.

For treating clay pots in nurseries, a relatively strong solution of one part of concentrate to four parts mineral spirits is advised, with the strength of the solution to be increased for greater control over algae growth.

Copper naphthenate has demonstrated a high effectiveness against a variety of organisms. In advised treatment quantities it resists attack from nearly all types of fungi and termites, powder post beetles, marine borers, and a number of other chewing and boring insects. At the same time it is, when used as directed, nontoxic to humans, plants, or animals.

The high preservative abilities of copper naphthenate were proven conclusively in December 1951 at the USDA Forest Products Laboratory at Saucier, Miss., a location noted for its high decay rate and incidence of severe termite damage. Pressure-treated southern pine stakes were dug up in December '51 after three and a half years of exposure, with the following results:

	x	xx	†
Copper Naphthenate	100	0	0
Pentachlorophenol	90	10	0
Coal tar creosote	70	30	0
Catalytic-gas base oil	30	70	0
Untreated	0	0	100

x % good
xx % Attacked; Serviceable
† % Destroyed

In another similar stake test, after nine years of exposure, the following results were reported, again with pressure-treated southern pine:

Copper Naphthenate	100	0	0
Pentachlorophenol	0	100	0
Phenyl Mercury Oleate	0	20	80
Mercuric Chloride	0	0	100
Untreated	0	0	100

It appears that the high percentage of success for copper naphthenate

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Selective Insecticides

AND THE BALANCE OF

Arthropod Populations

THE enormous increases in the yield of crops gained from the chemical control of insect and other pests now constitute such an important agricultural technique that the chemical industry carries a great responsibility in maintaining its usefulness. It would, therefore, be entirely wrong as well as foolish to disregard the storm signals which have appeared recently in the form of the growing number of strains of insects which are proving resistant to insecticides, and of the increasing number of experiences by agriculturalists of the resurgence of pests after chemical treatments. In the present economics of world agriculture, these failures of current chemical technique are so far not important. But those who are responsible for the research policy of major chemical concerns are looking ahead and giving some very necessary thought to the question whether chemical control as it is mainly practiced to-day is not to be seen as a purely temporary palliative, which may raise yields in the short run but will, over a period of years, end by saddling agriculture with pests which it will be impossible to wipe out, so that yields will fall again.

Clearly this is a challenge which science must meet. The danger can be exaggerated; but there is no denying that it exists. I recently went through the literature on the subject (1) and found about 50 recorded cases of insect pests which had shown resurgences (in American parlance, "flare-backs"), that is about 1 percent of the 5,000 or so insect and mite species of economic importance. This may not seem very serious; but when I gave an address on the subject of resurgences to an American scientific audience a similar number of further instances, which have not yet reached scientific literature, were given in the ensuing discussion. It sems fair to say that more than 2 percent of the world's pests have already shown powers of resistance to pesticidal treatments; perhaps a quarter of this number have developed resistant strains and new cases of resistance are turning up with great rapidity. Yet this reaction by nature has taken place after a relatively short period — extensive spraying is less than 20 years old—and the experiences of recent years have shown that others will follow. Resistant strains are particularly frequent amongst insects of medical importance, perhaps because they have been sprayed more frequently and have had therefore a larger number of generations in which to adjust themselves. Many of the agricultural pests which have shown this adaptation are also those which produce many generations a year, and are therefore among the most persistent injurious and ubiquitous enemies of the farmer.

The mechanism of resurgence has also been studied extensively, and we now understand it fairly well. The real cause has in almost all cases studied proved to be the destruction of predators and parasites along with the greater part of the pest population, though a few insects have been found whose fecundity is stimulated by certain insecticides. The creation of this basic imbalance in the ratio of pest and predator populations produces, in different ways, both the long term and the short term effects.

In the short-term, the destruction of predators may cause either (i) the rapid resurgence of the same pest arising from the survivors of the treatment or from migrants to the crops, or (ii) the more gradual development of a primarily unimportant insect into a new pest, resulting from the destruction of its predators by the treatment directed against the first pest. The vital factor in both cases is the tremendous rate at which pest populations can build up once the natural checks have been removed, because the predator species builds up much more slowly once the balance has been disturbed. The segregation of resistant strains is caused by the chemical elimination of all individuals of the pest species other than the genotypic variants, which happen to be resistant, and hence survive and breed without competition and without restraint by natural enemies.

The inter-relationship of plants and insect species is, of course, in practice extremely complex. But from the research upon it has flowed a new understanding of the environment of our crops, and a new conception of "crop medicine" which is now being tested. We now see crops as ecosystems of flora and fauna, as a field of interesting biological forces, with powers of defence against attacks of plant-eating organisms, analogous to the way in which medical science sees the human organism with its defence mechanism against mi-

crobes. Just as Ehrlich's work early in the century started medical chemotherapy on its path of selective toxicity against micro-organisms, so now we are beginning to develop selective pesticides for use against insect pests which will not damage the defensive systems of the natural enemies of the pests. Long before the war it was plain that we needed pesticidal treatments that would be selective between crop pests and beneficial insects, and simple methods had been evolved — for example by timing pesticidal treatments to an exposure sufficient to kill aphis but to leave predators capable of recovering from its effects (as with nicotine vapor); or by timing treatments for periods before predators are active.

But the real scientific advance which enables us to use rather than to abuse the balance in nature between pests and predators has come from the discovery of pesticides with a selective action that makes use of differences in the physiology of plant-feeding and flesh-eating species. The first example that such chemical selectivity exists came in 1944, and the first selective pesticide, schradan, was discovered in 1949. It was then found that schradan was toxic to certain plant-eating species, such as aphis, but did not kill their predators, such as ladybird beetles nor the parasite *Aphidius brassicae*. The chance discovery of the selectivity of schradan has been followed by the development of a process of coating unselective insecticides such as DDT, which eliminates the contact effect and depends on the release of the toxicity of the insecticide on the digestive enzymes in the insect which eats the pesticide. Differences in the enzyme systems of plant feeding and predacious or parasitic insects can therefore be used to produce a selective effect. As yet, we do not possess as many selective insecticides as we need, and the need for more research is urgent.

There are two forms of selectivity. The first is termed "physiological selectivity" because the insecticide does not kill predators either by contact or as the result of ingestion of aphis or other insects killed by the pesticide; this property is possessed by schradan and ryania. But there are also systemic insecticides whose selectivity is ecological; they are unselective if used as a contact pesticide, but if taken up by the sapstream of the plant become available only to the plant-eating species and do not kill predators that eat poisoned insects.

It is of great interest that the best explored selective insecticide, schradan, is one of the systemic chemicals which is not in itself toxic to the pests or their natural enemies. Only after this compound has been ingested by the pest do the pest's enzymes convert it into an insecticidal substance, while other non-selective systemics are converted into an insecticidal substance by enzymes in the plant itself.

There is an interesting parallel with selective weedkillers here; Professor Wain has evolved the new systemic herbicide substances which exploit differences in the enzyme systems of certain economic plants and weeds, so that the latter transform a substance harmless to crops into one toxic to themselves (3).

Research is underway investigating to what extent these new chemicals give us the power to swing the balance of nature back in favor of a pest's natural enemies—to strengthen, in fact, the "biotic resistance" of the crop. Successful experiments reported at the last International Entomological Congress at Montreal showed that it is no longer the best objective of the pesticide treatment to wipe out a pest completely, but rather to reduce the level of plant-eating insects to a point where the parasites and predators in the crop can again keep them so under control that no serious harm results to the crop, but leave its denfse mechanisms intact (2).

As the requirements of modern agriculture allow for no damage of the produce, only those parasites and predators are useful for this integration of chemical and biological control which are stalking the pest species when they are present in low numbers (low density dependent natural enemies).

At least one research organization in the chemical industry, mindful of the way in which danger can build up slowly and insidiously and then assume the proportions of a natural disaster which takes the world by surprise, is taking time by the forelock and working on this hypothesis with a view to combining biological and chemical methods of pest control in a new and more scientific technique, which will arrest the tendency of indiscriminate spraying with unselective chemicals to produce a fauna permanently poorer in predator and parasite species. If it is agreed that this is the right approach, how soon may we expect to be ready with a fully practical program? It may well be a decade or more before all the necessary work is done, and we have all the chemicals required to deal with widely different crops and natural environments.

The question of cost is also important. Will the new techniques,

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By W. E. RIPPER
Fisons Pest Control Ltd.
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Is chemical control—as practiced today—a temporary palliative . . . which will end by saddling agriculture with pests impossible to wipe out?

Sesoxane—*A New Synergist*

THE Fine Chemicals Division of Shulton, Inc., Clifton, N. J., at a special press conference held recently in Washington, announced the development of a process for manufacturing "Sesoxane," a new and reportedly superior synergist for pyrethrins and related insecticides. Richard E. Brainard, vice-president of the corporation and general manager of the Fine Chemicals Division, who made the announcement, stated that pyrethrin formulations utilizing the new synergist will be of special interest to formulators and packagers of insecticides where a safer product is required for use on grains, fruits, and in household sprays.

Sesoxane was discovered by Dr. Morton Beroza of the U. S. Department of Agriculture in Beltsville, Md., and reported by him as the 2-(2-ethoxyethoxy) ethyl 3,4-methylenedioxyphenyl acetal of acetaldehyde. Shulton has named the material Sesoxane and has adopted for it the chemical name 2-(3,4-methylenedioxyphenoxy)-3,6,9-trioxaundecane.

The announcement by Shulton followed the presentation of a special report by J. H. Fales of the Entomology Research Branch, Agriculture Research Service, USDA, Beltsville, at the 43rd annual meeting of the Chemical Specialties Manufacturers Association at the Mayflower Hotel, Washington, D. C. on Dec. 5. The report evaluated the synergist's effects with pyrethrins and allethrin against house flies, mosquitoes, cockroaches, and Japanese beetles.

The USDA tests showed Sesoxane to be superior in synergistic activity to other commercial pyrethrin synergists. Beacuse of its effectiveness, it is expected to cost less to use than other available synergist formulations for equal knockdown and kill. High kill can be obtained without the use of DDT or other toxic insecticides, the tests indicate. The new synergist is effective against cockroaches and other insects.

Sesoxane is said to be readily formulated in conventional equipment, since it is soluble in kerosene, the fluorinated hydrocarbon propellants, and other solvents. It has a faint, pleasant odor, and low acute oral toxicity (LD_{50}) of 2000 milligrams per kilogram in rats. Complete toxicological studies are in progress and several formulations are currently being prepared and evaluated for registration with the USDA.

Shulton's Fine Chemicals Division also produces Piperonal (Heliotropine), which is the basic chemical required for the manufacture of Sesoxane. One key to this product is its characteristic dioxymethylene bridge.

In USDA tests at Beltsville, the new synergist, when used in low pressure aerosols with pyrethrins gave markedly effective knock-down and kill results for the house fly, mosquito, roach, and Japanese beetle. Mr. Fales, in his discussion, reported that it gave good results in aircraft-type aerosols of the kind used to spray the interior of aircraft to prevent entry of Japanese beetles, fruit flies, and other types of insects.

For the USDA tests, the new synergist was designated as ENT-20871. Tests in aerosols and in space sprays, have been conducted by Messrs. Fales and Beroza, and Mrs. O. F. Bodenstein, all of the Entomology Research Branch, USDA.

Dr. James Hardwick, Shulton chemist and co-developer of the company's pilot production facilities for Sesoxane, terms it the "first really" big advance since 1948 and 1949, when synergists were first developed."

Discovery of the synergist was the result of observation of tests conducted early in the 1940's with pyrethrins and sesame oil as a synergist. Further studies revealed that sesamolin and sesamin together accounted for most of the synergistic activity of sesame oil for pyrethrins. Sesamolin, which has been shown to be about five times as synergistic as sesamin against the house fly, differs from sesamin in that it contains a 3,4-methylenedioxyphenoxy group in place of one of the 3,4-methylenedioxyphenyl groups in sesamin.

Because this structural difference caused such a marked change in activity, Dr. Beroza prepared a large number of methylenedioxyphenoxy compounds as candidate synergists. Many of the compounds showed synergism with pyrethrins and allethrin, but Sesoxane was superior to all other methylenedioxyphenoxy compounds Most of the synergists employed today contain the methylenedioxyphenyl group, but none contain the methylenedioxyphenoxy group except Sesoxane.★★

John H. Fales and Dr. Morton Beroza of the Entomology Research Branch, USDA, Beltsville, Md. Mr. Fales evaluated the synergist's effects against various insects and Dr. Beroza was the discoverer.

Pesticide Residues on Plants

*by George C. Decker**

Illinois Natural History Survey and Illinois Agricultural Experiment Station, Urbana, Ill.

EACH and every person involved in any way in the use of pesticides to control insects, plant diseases, rodents, or weeds shares with all others likewise involved the responsibility for making sure that the public health is not endangered. Many who may readily recognize their liability for crop damage and for accidents involving the illness or death of animals, including man, fail to recognize that they also share the responsibility to make sure that food and feed products remain free from objectionable residues. This includes the manufacturer, the formulator, the dealer, the applicator, and the farm operator.

Under the Food, Drug and Cosmetic Act, as amended in 1954 (The Miller Bill), no pesticide residues are permitted on or in any raw agricultural commodity except as they may be covered by an official tolerance or an exemption therefrom. This should be fully understood by all concerned, because in the case of a violation, if detected, the Food and Drug Administration will take action against the offending product, leaving the inevitable question of who will eventually pay the bill a matter of conjecture. In many cases, the answer may depend on a decision rendered by 12 men in a jury box. Thus, it behooves each and every one of us to make doubly sure that our operations are such as to be beyond reproach or even suspicion.

With the tolerances that must be met on all raw agricultural products marketed in the future, it becomes increasingly imperative that all of us acquire a working knowledge of the factors that determine the magnitude and persistence of insecticide residues. We are all well aware that spray residues on plants tend to decrease with time, and we know from experience that some tend to disappear more rapidly than others. The major factors involved are enumerated in Table 1, and it seems noteworthy that most of the common factors such as weathering, rate of plant growth, and type of formulation would apparently have a comparable, or more or less similar effect on all insecticide residues, which would be quite independent of the chemical involved. On the other hand, the rate of residue loss attributable to volatilization or decomposition would be largely determined by the specific properties of the insecticidal chemical used.

There is little that need be said about decomposition as a factor affecting the rate of residue loss, except to call attention to the fact that such products as pyrethrins and rotenone decompose rapidly when exposed to sunlight and air and that tetraethyl pyrophosphate, in the presence of water, hydrolizes so rapidly that it has little or no toxicity to insects or man in a matter of a few hours.

Several research workers have noted that vapor pressure or volatility of an insecticidal chemical is an important factor not to be overlooked in any consideration of insecticide residue persistence or rate of loss. There are those who regard insecticides in general as non-volatile, but that is not the case. There is much research data to show that, other factors being equal, there is a definite correlation between vapor tension and the rate of residue loss. To be sure, many other factors are operating at the same time, but it is more than a coincidence that when compounds are listed in the order of their vapor tension, they are also listed in the order of their residual effectiveness, and in the order of the persistence of their residues.

Recognizing vapor pressure as an important factor in determining the rate of residue dissipation or loss, one is not surprised to find that under controlled conditions in the laboratory, where many variables could be eliminated, the rate of residue loss is or approximates a straight-line logarithmic function of time. Furthermore, the common chlorinated hydrocarbons tend to disappear in the order: lindane, aldrin, heptachlor, chlordane, dieldrin, toxaphene, methoxychlor, and DDT. It is also worthy of note that when aldrin has disappeared, 6 percent of the DDT is still present. These same relationships prevail under field conditions, and this is particularly true when mature foliage is sprayed and the increment of growth factor is held to a minimum.

The growth of plants after treatment may greatly dilute residues as expressed in terms of parts per

*Based on a report presented at the Illinois Custom Spray Operators School, Illini Union, Urbana, Ill., January 24-25, 1957.

TABLE 1.

Factors Affecting Residue Persistence or Loss

Erosion	Common to all and variable—
Rain	—unpredictable
Wind	
Mechanical	
Growth	Common to all
Formulation	Common to all
Evaporation	Specific
Decomposition	Specific

TABLE 2.

Growth as a Factor in Determining Residues

Date		Days	Av. wt. gm.	% of initial residue	
May	18	0	4	100	
	28	10	12	33	
June	18	31	20	20	
"	25	38	23	17	
July	5	48	32	12	100
"	16	59	45	9	70
Aug.	14	88	99	4	33
Sept.	10	115	146	3	22

million (Table 2). In this example it is evident that, even if there were no other factors involved, a residue of 100 p.p.m. on small apples weighing 4 grams on May 18 would be reduced to only 3 p.p.m. at harvest time (September 10), when the apples had attained an average weight of 146 grams.

The growth rate of plants as a factor tending to reduce residues is likewise important in the case of other crops. Furthermore, the ratio of mass to surface area is a factor in determining the magnitude of initial residues when expressed as p.p.m. Thus when red clover plots in three distinct stages of growth—1"-2" tall, 5"-6" tall, and in full bloom, 15"-20" tall—are treated with DDT at the rate of 2 pounds per acre, we get quite different initial deposits, and because of the great differences in plant growth rates, we get three quite distinct slopes in our residue loss lines.

When young clover plants are sprayed, the initial deposits are high, but these residues tend to disappear rapidly, whereas when more mature plants are sprayed, the initial deposits are somewhat lower but the residues appear to be much more persistent.

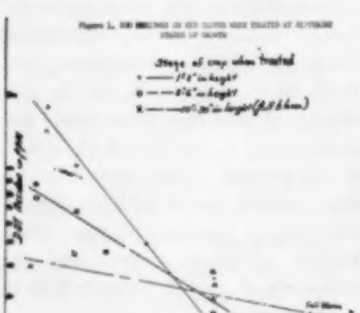
The rate of insecticide application (pounds per acre), of course, is the dominant factor in determining the magnitude of initial deposits. In general, the residues immediately after spraying and, for that matter, at any given interval after spraying will be closely related to the rate of application. For example, as shown in Table 3, DDT applied at the rate of 1, 2, 4, and 10 pounds per acre gave initial residues of 61, 109, 224, and 557 p.p.m. Twenty-one days later the residues were 4, 8, 15, and 36 p.p.m., and one may note that at all of the intervals shown (Table 3) the 1, 2, 4, 10 relationship was quite evident. However, noting that in 21 days residues on the plot treated at one pound per acre dropped only 57 p.p.m. (61-4) while the residues on the 10 pound per acre plot dropped 522 p:p.m. (568-46), one wonders if excessive dosage rates are not economically unsound as well as objectionable from the residue point of view. The very rapid rate at which large deposits are dissipated or lost is more clearly shown in Figure 2. Superficially, it would appear that for any particular insecticide exposed under a given set of conditions, the residue would reach

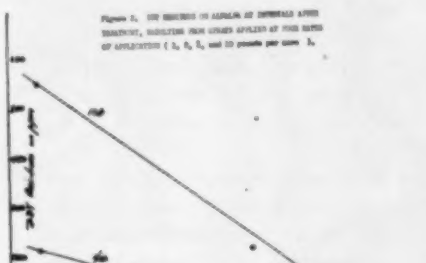
(*Continued on Page* 97)

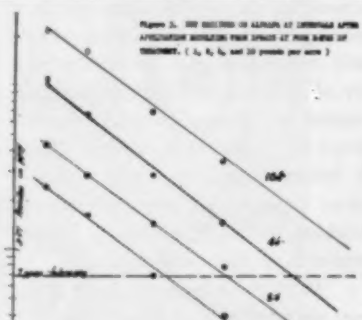
TABLE 3.

DDT Residues on Alfalfa in p.p.m. (September 1951)

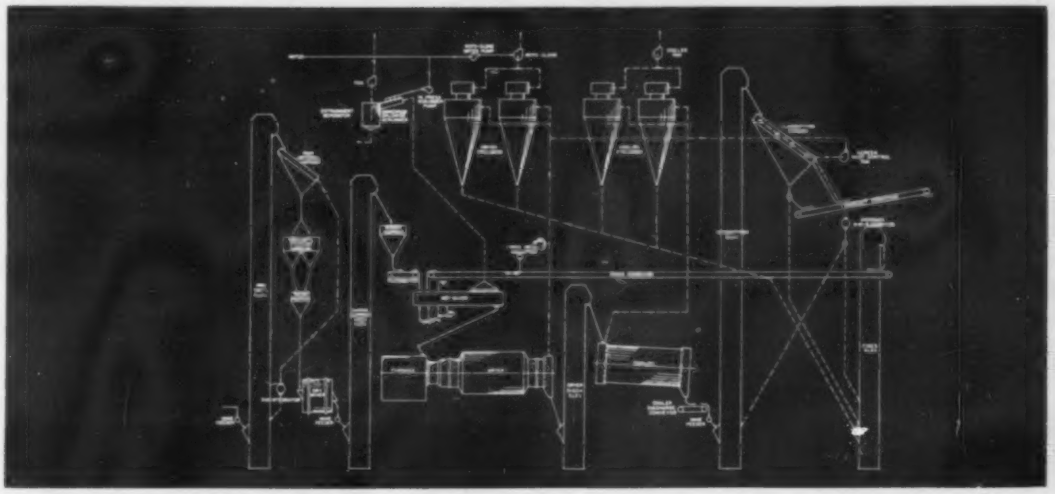
Days after Spraying	Application rate, pounds per acre			
	1#	2#	4#	10#
1/6	61	109	224	557
3	25	45	110	223
7	17	30	70	169
14	7	15	29	71
21	4	8	15	36

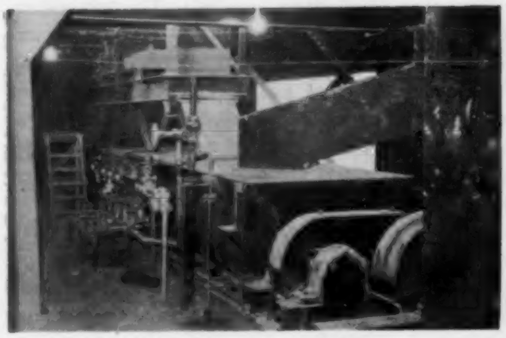






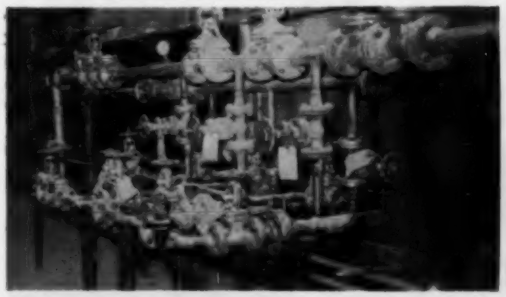
DAVISON'S TRENTON CONTINUOUS PROCESS FOR GRANULATION *





Top photo shows operating control room with automatic temperature control equipment.

Photo at left shows pug mixer with liquid distribution piping arrangement to the left.



Liquid distribution piping arrangement which introduces all liquids from one side of the pug mixer.

Burners and the furnace of the dryer and the discharge end of the cooler.

*Presented at the Fertilizer Industry Round Table, Washington, D. C., Oct. 16, 1956.

By J. E. Reynolds, Jr.

Davison Chemical Company
Division of W. R. Grace & Co.
Baltimore, Maryland

THE Davison-Trenton Process had its beginning the spring of 1953 at our Trenton, Missouri plant. During the past three years, the process has exhibited its adaptability to keep pace with the economical advantages of many different types of formulation practices. A recent report (1) presented the theories and practices of ammoniating and granulating fertilizers by the Trenton process. Development data, formulation data, and operating experiences were given also at that time. We now propose to take this group, the Fertilizer Industry Round Table, on an actual plant tour showing photographs which reveal the machinery and equipment used in the process.

To follow the flow of materials through, we start with the raw material supply system. Ingredients are fed separately into an elevator, which feeds a single deck screen. The screened dry ingredients are discharged into separate storage hoppers above a single weigh hopper. The

batch is weighed collectively into a single weigh hopper, and is then discharged into a two (2) ton rotary mixer. The blending achieved in the rotary mixer is established on a time cycle set for maximum retention in the mixer.

The blended dry batch is then elevated to the surge hopper. Constant flow is maintained from the surge hopper by means of a poidometer weigh belt discharging directly into a pug mixer. (The pug mixer is designed and arranged to permit thorough mixing of the dry materials and all recycle portions prior to coming in contact with the submerged liquids.)

The product from the wet mixer is discharged through a chute to a concurrent dryer. The dryer shown in this flow sheet is a DehydrO-Mat, but we also have several straight tube dryers. Sufficient heat and air is available to dry the heat sensitive-low free moisture grades, as well as the low nitrogen-high free moisture grades. The material from the dryer goes to the cooler, usually by means of an elevator. The larger coolers reduce the temperature of the product approximately 80-100°F. prior to passage across the double deck classifying screen. The boot of the classifying elevator is equipped with a rotary vane feeder to control the even flow of material to the elevator, and primarily to provide a seal for any potential "blow back."

The classifying screen is a 4'x15' W. S. Tyler double deck hummer screen, equipped with three panels of U. S. Standard 6 mesh top deck screens, and three panels of U. S. Standard 16 mesh bottom screens. A dust control fan applies suction to the screen hopper to remove dust and heat to the dryer cyclones. This same fan also applies suction to other dust control points, such as the point of discharge from the recycle or fines elevator.

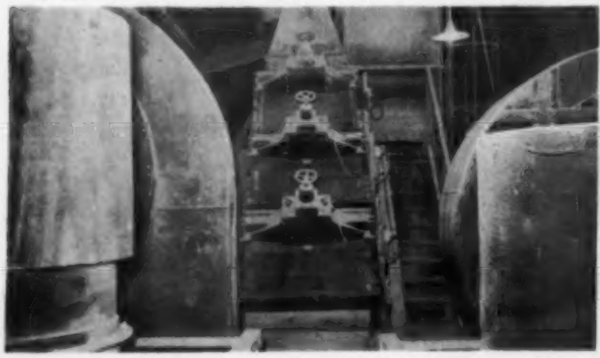
The oversize particles are cracked by a cage mill, or pulverizer, which returns the material across the screen to recover the acceptable particles. Approximately 60-70% of these particles will be recovered as product on this second time across the screen. The minus 16 (U. S. Standard) mesh particles are returned to the pug mixer via the fines elevator and conveyor belt. The closely sized acceptable particles are discharged onto the product belt which takes the material to storage, or a portion to storage and a portion to the recycle system. Cool, dry granules are returned to the wet mixer only for control of the wetness, temperature, and particle size formation necessary in the production of the highly concentrated mixed fertilzer grades. All recycle portions are combined on a conveyor belt which discharges into the dry raw materials feed end of the pug mixer. A continuous weigh indicator dial reports the total rate of recycle returned.

Dust collectors remove entrained dust from the dryer and cooler air streams. A wet fan arrangement is provided in the dryer air system to remove the excessively fine dust particles which might escape the dryer cyclone. This warm effluent liquid is returned to the wet mixer as make up water for the process. The transfer of heat from this warm water to the materials in the pug mixer assists in granulating the grades normally experiencing low reaction temperatures. The small solid particles from the cyclone are returned by chutes to the wet mixer by means of a recycle elevator conveyor system.

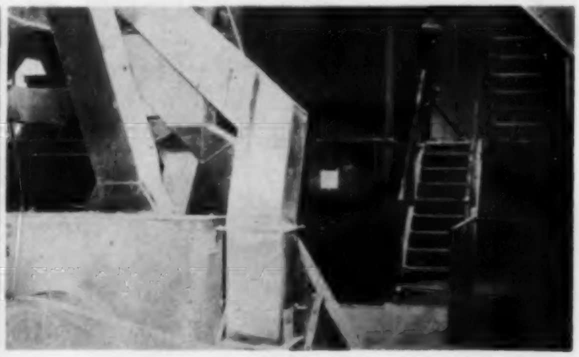
Figure 1 shows the operating control room. The automatic temperature control equipment for regulating the input of heat to the dryer is shown at the left. This control is designed for maintaining a desired dryer exhaust air temperature which is within 20-30°F. of the dryer product temperature. As less BTU's are required, and as the exhaust air temperature goes above the selected exhaust air control temperature, the input of heat is reduced. Conversely, if more heat is expended during passage through the dryer, and the dryer exhaust air temperature is reduced, the temperature controls activate the fuel supply to obtain additional heat. The next two recording charts on the top are for maintaining a record of the formulated nitrogen solution and anhydrous ammonia. The two bottom instruments on the left are for indicating the total rate of recycle to the system, and the recording instrument provides a record of the natural gas consumption. Other indicating flowraters are available on this panel for sulfuric acid, phosphoric acid, and water. The panel on the back wall has starter buttons for the pumps, poidometer, and the wet mixer; ammeters for such motors as the wet mixer, dryer fan, cooler fan, disintegrators, elevators, etc.; running lights for the major pieces of equipment; bindi-

(Continued on Page 105)

The classifying screen, below, utilizes American Air Filter Rotoclone to remove particles smaller than can be removed by the conventional cyclone.



Oversize particles from the classifying screen are "cracked" in the pulverizer, below, and returned through the cycle.



One of Marsh Aviation's 33 aircraft skims the leaf-tops applying insecticide dust to a sugar beet crop in Arizona.

AERIAL APPLICATION AT MARSH AVIATION

MARSH Aviation Co., Phoenix, started operations in 1944 with three Stearman C3R airplanes and serviced only Maricopa County, an area of twenty miles around Phoenix. The firm's basic business consisted of spraying and dusting alfalfa, cotton, and vegetables.

Today, Marsh operates from a main base at Phoenix and has eight other bases in Arizona and one in the State of Washington. The company operates some 33 aircraft, consisting of 22 Navy N3N's, ten Boeing PT-17's and one multi-engined Boeing 247-D. The 32 single engined craft are easily converted from dusters to sprayers while the 247-D is used for timber and grasshopper spraying on large projects.

In recent years, Marsh has done agricultural aircraft work in Washington, Oregon, Idaho, Montana, South Dakota, California, Arizona, New Mexico, Texas, New York, New Jersey, Pennsylvania, Utah, and Colorado. The firm has always been active in experimental work, including some of the first aerial application of herbicides on wheat. It is now doing experimental work on weed control in peas and cotton, and has carried out a considerable amount of experimental work on mesquite control in the deserts.

Marsh prides itself on its rigid requirements for pilots. Two years of dusting and spraying experience, and 3,500 hours of single engine flying time requirements are among the highest in the industry.

The organization of Marsh Aviation follows a pattern set by the commercial airlines. The company is divided into: flying operations, maintenance, public relations, sales, training, and cost analysis.

The last division listed, though perhaps the least familiar, is by no means the least important. The company feels that one of the largest problems in agricultural flying is that of determining costs. Prices for aerial application vary in different sections of the country, some of them reaching extreme figures, because of uncertainty on the part of operators as to what their costs are.

(Continued on Page 107)

Shell Workshop Offers Nematode Training to 200

More than 200 persons attended the Shell Chemical Nematology Workshop, Jan. 16 and 17, in New York. Purpose of the workshop was to demonstrate the proper procedures of soil fumigation for nematode control.

FOURTEEN of the nation's leading authorities on nematodes led the discussions at the first Shell Nematology Workshop held at the Biltmore Hotel in New York on Jan. 16 and 17. More than 200 dealers, formulators, manufacturers, applicators, and scientists attended the meeting which was sponsored by the Shell Chemical Corp., New York, to disseminate information on this relatively unknown pest.

Dr. W. R. Jenkins, assistant professor of plant pathology, University of Maryland, opened the workshop with a general description and background on nematodes. Although mainly concerned with nematodes which attack plants, Dr. Jenkins pointed out that nematodes are perhaps the most numerous of all forms of animal life and have been found in virtually all parts of the earth.

Because plant parasitic nematodes are invisible to the naked eye, Dr. Jenkins stated, their infestations are not readily apparent. The primary symptoms are a gradual stunting of growth and reduction in yield. Mere presence of these symptoms, however, is not proof of nematode injury, he said, for many other pathogens can cause injuries similar in appearance. An examination of soil and roots by a specialist is the only reliable way to be sure of a nematode infestation.

Speaking on the control of nematodes once they have been discovered, Dr. W. F. Mai, Cornell University, Ithaca, N. Y., discussed the history of nematode control and told of hope for future control improvements.

Dr. Mai traced the development of Shell's D-D and Nemagon soil fumigants. "The discovery of the nematocidal properties in D-D Soil Fumigant in 1942 in Hawaii was one of the most important factors in stimulating the current interest in soil fumigation," Dr. Mai said.

"I am looking forward to the time," Dr. Mai summarized, "when we will be applying more chemicals to the roots than we now apply to the tops of plants."

The economics of soil fumigation were discussed by A. L. Taylor, head of the nematology section, Agricultural Research Service, U. S. D. A., who called nematodes a widespread and important economic problem in the U. S. and all parts of the world. Speaking of developing market areas for the sale of nematicides, Mr. Taylor said, "If yields cannot be increased at by least four times the cost of fumigation, the market is doubtful."

"When looking for a place to sell soil fumigants," he concluded, "try to figure out where the money is, you can be sure the nematodes will be there."

The use of D-D and Nemagon as soil fumigants was discussed by C. W. McBeth, Agricultural Research Division, Shell Development Co., Modesto, Calif. Mr. McBeth termed the activity of Nemagon and D-D as very similar in the control of soil infesting nematodes. Both materials are applied as liquids. They volatilize and spread through the soil in the vapor phase. D-D is preferred as a preplant material, Mr. McBeth said, while Nemagon is favored in the treatment of living established plants.

Utilizing one of the largest and most complete displays of soil fumigation equipment ever accumulated under one roof, Dr. E. F. Feichtmeir reviewed application methods for the various crops in different sections of the country. Dr. Feichtmeir described the equipment and showed the principles behind each type. "We will not attempt to recommend one type of applicator over any other," he said, "because it is largely a matter of personal preference."

M. H. Keel, advertising department manager for Shell Chemical Corp., spoke on the supports and

(*Continued on Page* 110)

Technical
SECTION

SAMPLING of FERTILIZERS and MATERIALS

By W. A. Archer
International Minerals & Chemical Corp.

DURING the last few years, the demand for high analysis regular, semi-granular, and granular fertilizers has greatly increased, and thus quality control, of which sampling and analysis is an important part, is becoming increasingly important as the materials used and mixtures produced become more concentrated.

It is important that the operator know, at all times, the composition of his raw materials, base piles, and the composition of his finished product. The composition of his raw materials base pile is determined by three consecutive steps, namely: the taking of samples, their preparation and their analysis.

The analysis of an improperly drawn or improperly prepared sample is worse than no analysis at all, since the analysis of such a sample is mis-leading. Therefore, it is necessary that the man who is assigned to the job of taking and preparing samples be fully trained, and that his sample room be equipped with the necessary sampling tools. Some typical sampling instruments are described below:

The Tube Sampler is Suitable for Sampling:

1. Incoming bulk raw materials
2. Base production when conveyed to storage in bulk
3. Regular mixed goods shipped in open mouth bags
4. Bulk mixed goods or superphosphate shipments

The Double Tube Slotted Type Sampler is commonly used for Sampling:

1. Bagged incoming raw materials
2. Regular or granular mixed goods shipments

Special Sampling Cup

Base production of regular or granular goods can best be sampled with an automatic sampler. However, if the automatic sampler is not available, a representative sample can be taken with this special sampling cup. The sample is taken by passing the special cup through the stream of material as it drops from a transfer belt. The cup should be passed in a direction parallel to the head drum and should cut the entire stream. The cup is useful also for sampling superphosphate which is shipped in bulk, and for sampling mixed goods which are shipped in bulk, provided the goods are moved to box car or truck by means of transfer belts.

Modified Soil Auger

The sampling of a free flowing granular stock pile is somewhat of a problem, due to the fact, that the goods will not stay in the sampling instrument. This problem can be largely overcome by using a modified soil auger. The modification simply consists in adding a shaped steel plate to one side of the auger to retain the sample when the auger is withdrawn from the pile. It is well to have an indicator mark on the handle of the auger so the sample man will know the position in which to hold the auger when it is withdrawn from the pile.

Sample Container

The sample man should have a supply of rugged, light weight sample containers. Sketch (following page) shows an inexpensive container which we have used for some time. We find it is well received by the plant people. It is constructed of ½″ plywood with suitable cover and carrying strap. The container is 10″ wide, 20″ long and 8″ deep, and holds about 4 gallons of sample.

Sample Preparation Table

The sample man should have a convenient work table for preparing the samples. Shown (next page) is a very useful inexpensive sample table. It is ruggedly constructed. The table has a smooth masonite top 7′ x 3′6″, and a plywood chute at the end of the table. The chute is used for disposing of sample rejects. This is a convenient feature of the table and is an aid to the sample man in keeping his room clean.

TABLE 1.
Analysis Comparison—Exchange Samples

	State Laboratory Working Sample			IM&CC Laboratory Working Sample		
	Nit.	A.P.A.	Potash	Nit.	A.P.A.	Potash
Exchange Sample No. 1						
State Analysis	8.40%	21.74%	9.44% (1)	10.64%	20.34%	9.20% (3)
IM&CC Analysis	10.75	21.37	9.05 (4)	10.95	21.05	9.11 (2)
Exchange Sample No. 2						
State Analysis	10.84	20.89	8.51 (1)	8.46	21.73	10.30 (3)
IM&CC Analysis	8.50	21.88	10.10 (4)	8.90	21.07	10.08 (2)
Exchange Sample No. 3						
State Analysis	6.47	15.70	4.94 (1)	6.52	16.29	5.32 (3)
IM&CC Analysis	6.45	16.20	5.75 (4)	6.70	16.18	5.78 (2)

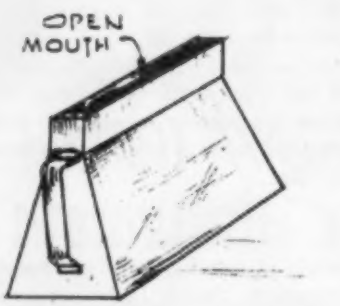
(1) Initial analysis reported by State.
(2) State furnished IM&CC an unground sample—IM&CC Analysis.
(3) IM&CC furnished State a portion of ground working sample (2).
(4) State furnished IM&CC with ground sample—IM&CC Analysis.

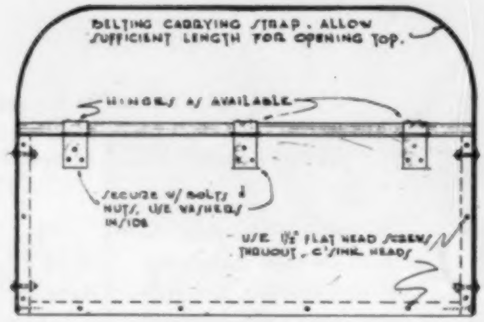
* Presented at the Fertilizer Industry Round Table, October 16, 1956, Washington, D. C.

Stock Pile Sampling

Now let us look at the problem of stock pile sampling. Shown in figure 5 as sketch 1 is a cone shaped pile. The pile should be sampled by drilling 2 holes equal distance apart around the pile, in section B, and by drilling 6 holes equal distance apart around the pile in section C. It can be shown mathematically that if a pile is sampled as indicated, the resulting analysis of the sample should be representative of the entire pile or of the face section of the pile, depending on the depth to which the sample holes are bored.

Left Modified Soil Auger





Sample Container

A number of tests were made in an attempt to prove the above method of stock pile sampling. The tests were made by taking a sample from a shovel as the pile of superphosphate was moved to base manufacture. These tests indicated that the analysis of the sample taken from the tractor varied in A.P.A. analysis ½ to 1% from the analysis of the sample taken from the pile. The comparison indicated that the analysis of the sample taken from the shovel was more correct than the analysis of the sample taken from the pile. Therefore, there is a definite need for developing a method for stock pile sampling.

Comparative screen analyses of samples taken with a 1" diameter and ⅝" diameter Indiana type slotted, tubes were made on 12-12-12, 10-10-10, 5-20-20, 4-24-12, 5-10-15 and 5-10-10. In all instances, except possibly the 4-24-12 and the 5-10-10, samples taken with the smaller diameter tube contained too great a proportion of fines. Since all size particles do not necessarily have the exact same analysis, this data indicates that the ⅝" tube which is commonly used may not be large enough to sample granular fertilizer. Therefore, the analysis of a sample taken with the ⅝" diameter tube may be mis-leading.

Comparison — Exchange Samples

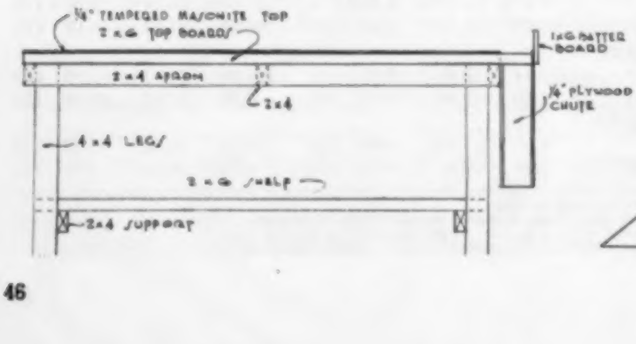
THE data presented in Table 1 indicate there is a problem in dividing a granular sample. Looking at the data—exchange sample No. 1 (1) is the initial analysis reported by the state. You will note that the nitrogen report is 8.40%. On the other hand, the IM&CC laboratory analysis of a sample which the state furnished indicated 10.95% nitrogen. This was a granular sample and the sample sent us was unground. A portion of our ground sample (2) was sent to the state and the state reported 10.64% nitrogen (3) which confirmed our findings. In view of these variances, we asked the state to furnish us with a portion of a ground sample and the analysis of this sample is reported as (4) with the nitrogen well above 10.00%. Exchange samples Nos. 2, 3, 4, 5 and 6 show somewhat similar results, but perhaps not as great as shown under exchange sample No. 1. I believe that it is necessary to grind a granular sample before it can be reduced in size and divided.

Analysis of Plant Granular Samples Reduced to Laboratory Size

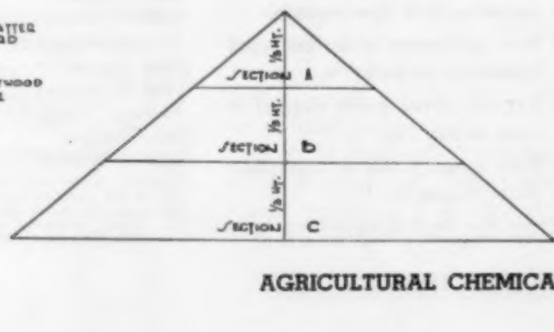
IN view of the results of the exchange samples reported, it was decided to make a study of the various methods of reducing the size of

(Continued on Page 99)

Sample preparation table



Stock pile sampling



Electrons For Insect Study

A one million volt electron beam machine for research in cold sterilization of Michigan agricultural products has been installed in the Agricultural Engineering Department of Michigan State University at East Lansing.

A 1,000,000 volt potential in the machine causes the electrons to rush through a vacuum tube and out through a thin metal window. Travelling at almost the speed of light, the electrons hit the product which is to be irradiated and produce ionization or chemical effects.

This process of irradiating products is commonly called cold sterilization because there is only a slight temperature rise in the product being irradiated. The advantage of the electron beam machine is that it will deliver a dose in a fraction of a second that would require hours to deliver with the usual source of cobalt 60 rods.

Although it required a large dose of irradiation to kill the granary weevil, it took but a small dose to prevent eggs from hatching and, what is more important, only the same small dose was required to prevent adults from reproducing. Similar effects were obtained with the flour beetle.

Work at Michigan State is being continued. Intensive studies are now underway on 11 kinds of insects and the materials they infest.

•

Cyanamid Tests Pollution

An elaborate system for checking pollution is being prepared by the American Cyanamid Co., New York, for its proposed triple superphosphate plant at Brewster, Fla.

Production at the new plant is not scheduled to begin until this summer, but a five-year study of air and water pollution in the Brewster area is already underway.

First job of the elaborate sampling system is to determine just what contaminants are in the air and water at the present time. The system's second task will be to serve as a double check on the pollution abatement equipment being built in the plant.

Keystone of the pollution defense system is the company's weather station which constantly records wind direction and velocity, humidity, barometric pressure, temperature, and rainfall. Measurement of these conditions provides the necessary data for calculating stack emission patterns.

Air sampling, dustfall sampling, and stream sampling will be carried out by automatic sampling stations scattered throughout an area surrounding the plant for one mile.

Chief pollution defense within the plant itself will be a battery of specially constructed scrubbers, waste water treatment and settling tanks, and a 200-foot high stack.

Aside from its contribution to the direct operation of the superphosphate plant, the pollution system is expected to help refute any unfounded accusation of pollution guilt. A public demonstration of Cyanamid's pollution preparedness has already gone a long way towards allaying local residents' fears that the new plant would compound pollution problems around Brewster.

•

Oil Reduces Fertilizer Caking

Wisconsin Agricultural Experiment Station investigators have reached the conclusion that "a little oil," mixed with fertilizer, reduces dustiness and caking and does not affect crop yields. Greenhouse and field trials with oats, corn and tobacco definitely show, says a brief progress report from the station, that the oil additions are safe, and the fertilizer-oil mixture seems to have better handling qualities. These findings, it is explained, may be of interest to fertilizer manufacturers who may want to add small amounts of oil to their products to make them less corrosive, less likely to cake in storage and less dusty to handle.

Members of the station soils staff measured yields and chemical composition of plants grown with regular 10-10-10 fertilizers, and with fertilizer that had various amounts of fuel oil or motor oil added. These additions ranged from 0.2 percent to 5 percent, and the fertilizers were applied at rates of from 500 lbs. to 1 ton per acre, with the seed or broadcast before planting.

"Though fertilization made a difference in yields," says the report, "it did not matter whether the fertilizer contained oil or not. Measurements of the amount of nitrogen, phosphorus and potassium taken up by the plants also show that the fertilizer containing oil supplies these elements as well as that without oil."

The results with tobacco are particularly important, the report points out. Fertilizer easily affects the burn quality of this crop but, after two years, no bad effects showed up. The researchers expect no harmful oil build-up in the soil after several years of continuous use.

•

Success Against Thistle

An account of the successful war waged against the Canada Thistle in 1954 is contained in the Fall, 1956 issue of *Cyanagrams,* published by the American Cyanamid Co., New York. Back in the 1930's the only control was with the chlorate chemicals, which actually "sterilized" the soil. In the 1940's, 2,4-D seemed to do the job but new plants sprang up from the roots.

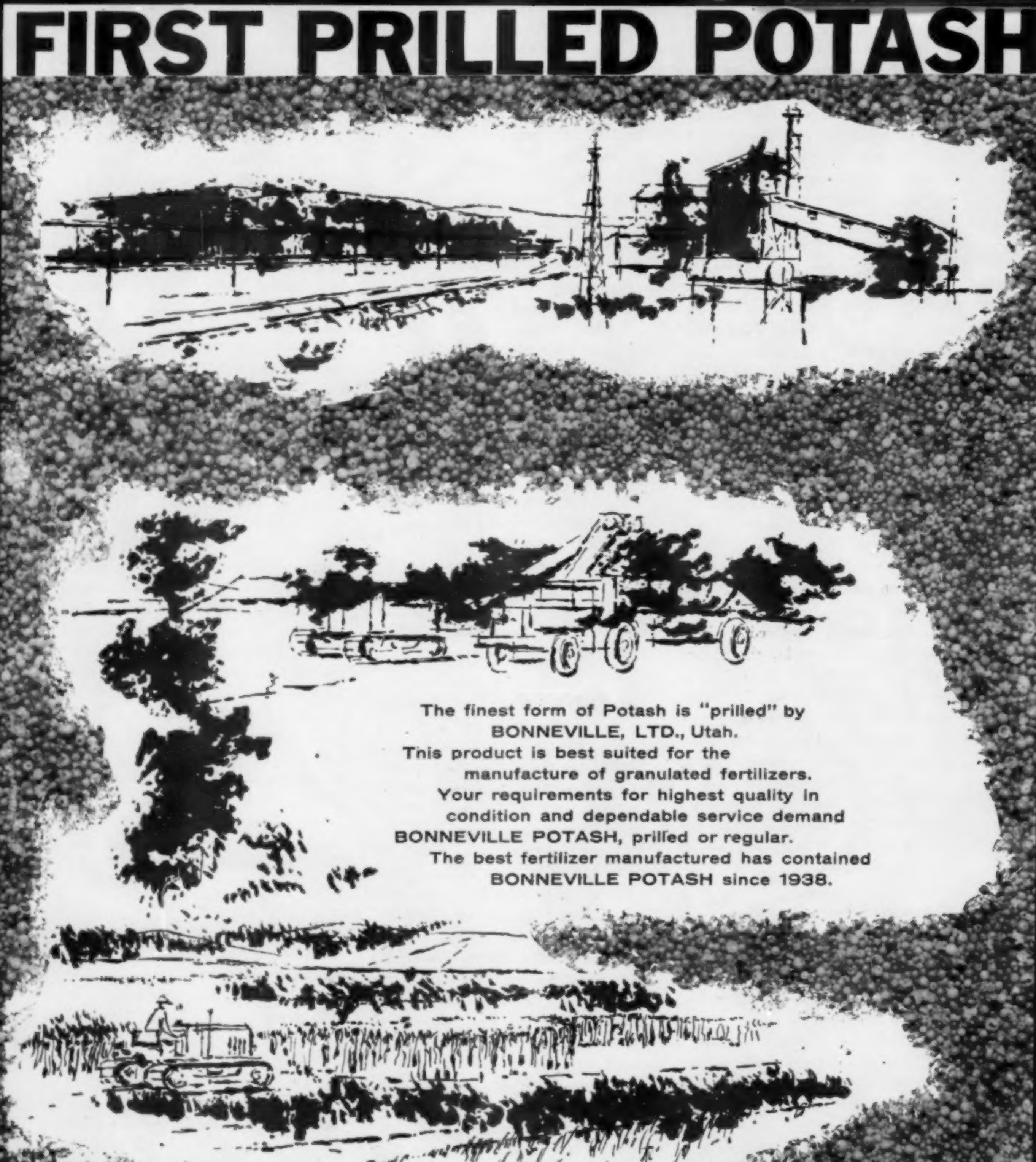
In 1954, researchers first tried the new chemical amino triazole which appeared to upset the chlorophyll-manufacturing process. When applied to actively growing plants in the spring, amino triazole not only killed these growing plants but moved into the root system attacking the root node.

•

Africa Tests New Herbicide

Among the May & Baker Ltd., England, agricultural products exhibited at the East African Trade and Industry show recently, Tropotox commanded special interest.

It is a selective weedkiller containing the new chemical M.C.P.B., and has been used widely for two seasons by farmers in the U.K., but is new to East Africa where trials have been laid down under local conditions. M.C.P.B. is harmless to clovers and many important varieties of peas as well as to cereals and grasses and it is safe to spray cereals with Tropotox at the two leaf stage. (Ed: Further information should be requested from May & Baker.)


FIRST PRILLED POTASH
The finest form of Potash is "prilled" by BONNEVILLE, LTD., Utah.
This product is best suited for the manufacture of granulated fertilizers.
Your requirements for highest quality in condition and dependable service demand BONNEVILLE POTASH, prilled or regular.
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FERTILIZER
Views and News

By Vincent Sauchelli

Water Solubility of Phosphates

HOW important is water-solubility in a phosphate fertilizer material? This question is being debated more and more throughout agronomic and industry circles. Under certain conditions it is of paramount importance; under others, perhaps, of less or little importance. The manufacturer has to consider the cost of producing highly soluble phosphates and maintaining them in that condition during subsequent processing and storage. Agronomists look at the problem from the yield response on certain soils which tend strongly to reduce the solubility or give no economic response to the non-soluble type. The agronomist's attitude becomes more or less the farmer's attitude; since the latter is attentive to the recommendations of local agronomic authorities.

In the United States, the crop availability of a phosphate comprises water-soluble and citrate-soluble phosphorus. In Great Britain and a few other countries, water solubility is the only criterion, and the manufacturer receives no credit for the citrate soluble. Alkaline, neutral and calcareous soils, are known to respond best to a water-soluble phosphate. Plants having a short growing season, such as some market gardening crops and particularly in a cool season, are able to utilize the phosphorus from a water soluble source more rapidly than from a non-soluble material. This is a big advantage from the farmer's viewpoint. Forage and pasture plants on the other hand may be able, under most general conditions, to do satisfactorily with the citrate-soluble kind. Research wtih radio-active phosphorus has demonstrated fertilizer placement influences uptake: plants may derive as much as three-fourths of their absorbed phosphorus during the early stages of growth from sources present in the root zone from hill or row placement. Deeper plow-down placement is not reached until much later in growth cycle if at all.

Another physical factor affecting rapid uptake of phosphorus is, according to TVA tests, the form of the fertilizer. Granulated sources of different mesh size and solubility behave differently; small granules are more effective with low water solubility, whereas large granules are best with high water solubility.

The growing practice of ammoniating superphosphates in the production of mixed fertilizers is reducing by half or more the percentage of water-soluble phosphorus. The solubility originally present in the superphosphates is in the range of 75 to 90 per cent. Ammoniation converts monocalcium phosphate to water-soluble ammonium phosphates, and water-insoluble dicalcium phosphate and some other less soluble calcium phosphates, depending on rate of ammoniation and drying and cooling conditions. Since the guaranteed "available phosphate" of a fertilizer comprises the sum of the water-and citrate-soluble phosphates, the manufacturer generally makes no effort to maintain water solubility at a fixed level, even though he does keep it within a certain satisfactory range. The favorable experience of farmers in most regions east of the Plains States in producing crops with fertilizers furnished them since ammoniation began in the 1930's would indicate that the degree of water solubility in currently produced fertilizers is not a problem. Farmers in the Pacific Coast States and in some of the calcareous soil areas of the Middle West are more concerned with water solubility: their preference for ammonium phosphates and liquid fertilizers may be a reflection of this concern. Field tests on many podzol soils having a high phosphate fixing capacity prove conclusively that citrate-soluble phosphates are as effective in supplying phosphorus as the water-soluble kind.

It must be obvious that no hard and fast generalization can be made about the merits of water solubility. Soil, crop, and individual judgment based on local experience will have to be depended upon to get a practical, satisfying answer. As Dr. T. H. Rogers of Alabama AES so well summarized his comprehensive survey*: "Absorption data using tracer technique have rated phosphates as follows: Superphosphate (20%) = ammonium phosphate > calcium metaphosphate > dicalcium phosphate > tricalcium phosphate. Marked differences in the availability of superphosphate and dicalcium phosphate as expressed in percentage of fertilizer phosphorus absorbed by plants have not been reflected in crop yields."

"Deficiency Concept" Too Restrictive?

IS the concept of "deficiency" of a nutrient element too narrow and restrictive? Some scientists question it, contending that by concentrating on this concept the equally essential concept of "replenishment" of minerals is ignored or played down. On general farms a substantial amount of mineral elements, major and minor, is continuously lost with the sale of animals and animal products, and crops: farming becomes more intensive as it becomes indus-

*Vol. IV Agronomy Series Monographs, page 236

trialized, and the soil's native content of nutrient elements becomes depleted at a more rapid rate. Good management is aware of this drain on the soil's nutrient elements, and replenishes it with an amount of minerals at least equal to that removed.

It is always refreshing to read what scientists in other lands are investigating and finding about agricultural problems. In the realm of animal agriculture, the reports from New Zealand and Australia are most interesting and informative. "Down under" each country has vast areas of land which in the virginal state were inadequately supplied with plant nutrients, particularly the trace elements. It is understandable then why investigators concern themselves so much with molybdenum, cobalt, copper, and zinc deficiencies. Crop responses to trace-elemented fertilizers have been remarkably favorable. One of the leading local authorities on grassland, Dr. J. Melville has been emphasizing to farmer audiences that the sound nutrition of plant and grazing animal involves no less than 12 mineral elements, and deplored that many farmers currently failed to recognize this fact. Other scientists have shown that as the carrying capacity of grasslands jumps to higher levels the original percentage of trace elements may become seriously inadequate. This certainly has proved to be the case with vegetable growers: the trace-element nutritional level adequate, for example, to grow 5 tons of tomatoes per acre may prove to be totally inadequate to make a 10 or 15-ton crop.

Nutrient deficiencies can be masked, and they can also be induced by deficiencies and excesses of other plant nutrients. Deficiencies in plants or animals are perhaps the general rule rather than the exception. It is not easy or simple to detect deficiencies. For example, an excess of potassium may induce a deficiency of magnesium, especially if the amount of magnesium is just on the borderline; an excess of nitrate, nitrogen, or chlorine can decrease the absorption of phosphorus or sulfur.

Perhaps it is time to change the attitude toward trace element fertilization. Major elements (N,P,K.) are applied widely on the basis that they will prevent deficiencies and maintain a high level of productivity. Farmers generally do not wait for specific symptoms of nitrogen. phosphorus, or potassium deficiencies before applying a complete fertilizer to the cropland. If they did, the chances are that the crop would not be nourished profitably. Some of this same reasoning is now in order with respect to the trace elements. The fertilization of grasslands has three purposes: to benefit the forage plants directly; to benefit the grazing animals indirectly; and to replenish the nutritive elements removed and lost to the farm through the sale of animals and their products—milk, wool, live-stock.

The "A" Value

QUESTION: *What is meant by the "A" value? This term is frequently used in articles dealing with phosphorus nutrition of crops.*

ANSWER: The term "A" value is a concept which was developed by soil scientists to measure available soil nutrients. It is not restricted to the measurement of nutrient phosphorus. A number of factors in the soil affect the availability of a plant nutrient so that the amount of a soil nutrient available to a plant depends on the soil type and the specific conditions under which the crop is grown.

The soil scientist measures the available amounts by comparing it with an accepted standard which now is generally a radio isotope. The amount of the isotope absorbed by the plant can be calculated by means of the so-called "tracer technique" involving a Geiger counter.

To answer the question: assume that the soil contains native phosphorus (P) in these various forms: tied up in organic matter, adsorbed on the soil colloidal complex, and dissolved in the soil solution. Then to this soil is added a phosphatic compound which contains available phosphorus in the form of radioactive P32. A plant faced with these two sources of available phosphorus will absorb the phosphorus in direct proportion to the amount of these present.. The "A" value is the amount of soil phosphorus which is as available to the plant as compared with the amount in the applied phosphate. It is determined mathematically by measuring the relative amount of soil phosphorus, and the applied phosphorus absorbed by the crop.

As stated previously, one of the sources, namely radioactive phosphorus is used as a standard because it is possible to trace and measure the amount absorbed by means of the Geiger counter. Since the proportion of the phosphorus derived from this standard is determined, it is possible then to calculate the amount of the nutrient contributed by the soil in terms of this standard. The relationship is set down in the form of an equation as follows:

Let A and B represent the two sources of phosphorus. If the plants absorb nutrient phosphorus from these two sources in direct proportion to the respective amount available, then we can indicate this as

$$\frac{A_{soil}}{B_{soil}} = \frac{A_{plant}}{B_{plant}} \qquad (1)$$

"A soil" and "B soil" represent the amount of phosphorus available in sources A and B respectively; and "A plant" and "B plant," the amounts of phosphorus the crop has absorbed from sources A and B.

The total amount of nutrients absorbed is, A plant + B plant. The proportion of nutrient P absorbed from the applied standard can be written as:

$$\frac{B_{plant}}{A_{plant} + B_{plant}} \quad \text{or} \quad \frac{B_p}{A_p + B_p}$$

If now we let $y = \dfrac{B_p}{A_p + B_p}$

or $y\,(A_p + B_p) = B_p$. Transposing, we get

$$yA_p = B_p\text{-}yB_p.$$
$$= B_p\ (1—y). \quad \text{Then,}$$
$$A_p = \frac{B_p\ (1—y)}{y}$$

Translating this equation into words, we can say: the amount of available nutrient in the soil can be determined in terms of a standard if the proportion of the nutrient in the plant which is absorbed from this standard can be calculated.★★

1956 Fungicide Tests

Part I

THE American Phytopathological Society temporary advisory committee on collecting and disseminatory data on new fungicides herewith presents its fourth annual summary of fungicide and nematocide tests. (See *Agricultural Chemicals* for April, May and June 1956; April, May and June 1955; and January, February and March 1954 for previous summaries). Grateful acknowledgement is made to the 87 cooperators in 24 states, one Canadian province, and the Philippines, who have sent in this 1956 data, also to the editors and staff of *Agricultural Chemicals* for their cooperation in publishing it, and to the many firms listed in the 1953 summary who set up the original revolving fund with the A. P. Society that made this project possible. The committee members are, J. W. Heuberger, P. R. Miller, R. H. Wellman, A. G. Newhall and L. Gordon Utter, chairman. This report was prepared by A. G. Newhall.

Cooperators and Locations of Experiment

Alabama
1. J. A. Lyle and C. A. Brogden
2. Urban L. Diener and C. C. Carlton

California
3. J. B. Kendrick, Jr. and A. O. Paulus
4. T. A. DeWolfe, E. C. Calavan, L. G. Weathers, L. J. Klotz

Connecticut
5. P. M. Miller

Delaware
6. D. F. Crossan and P. J. Lloyd
7. J. W. Heuberger and I. F. Brown, Jr.
8. J. W. Heuberger and M. Q. Sayed

Florida
9. R. S. Cox
10. R. S. Cox and N. C. Hayslip
11. J. F. Darby
12. Grover Sowell, Jr.
13. R. R. Kincaid
14. Norman C. Schenck and J. M. Crall

Georgia
15. A. A. Foster

Idaho
16. Lawrence H. Purdy
17. S. W. Guthrie

Illinois
18. Dwight Powell

Maryland
19. W. J. Zaumeyer
20. W. J. Zaumeyer and R. E. Wester
21. W. D. McClellan, Floyd F. Smith, Edgar A. Taylor
22. W. D. McClellan

New Hampshire
23. Avery Rich

New Mexico
24. John E. Chilton

New York
25. A. G. Newhall
26. C. D. Lewis
27. A. G. Newhall and J. M. Kainski
28. Arden Sherf
29. D. H. Palmiter
30. R. C. Cetas
31. R. E. Partyka
32. W. T. Schroeder
33. A. W. Dimock, D. F. Bateman, L. Wilcox, D. W. Rule
34. K. G. Parker, W. D. Mills, N. S. Luepschen

North Carolina
35. C. N. Clayton
36. C. N. Clayton, A. J. Nielsen
37. C. J. Nusbaum and Furney A. Todd

Ohio
38. H. F. Winter

Oklahoma
39. Richard H. Converse
40. F. Ben Struble and Lou Morrison

Oregon
41. J. R. Kienholz
42. Edward K. Vaughan
43. Lawrence H. Purdy

Pennsylvania
44. F. H. Lewis and K. D. Hickey
45. Harry C. Fink
46. Harry C. Fink and Kenneth Zeiders

South Carolina
47. C. H. Arndt
48. W. M. Epps
49. R. W. Earhart
50. Quintin L. Holdeman

Tennessee
51. E. L. Felix

Texas
52. E. W. Lyle

Virginia
53. A. B. Groves
54. S. A. Wingard, R. G. Henderson, Luben Spasoff
55. T. J. Nugent

Washington
56. Roderick Sprague
57. Lawrence H. Purdy
58. C. J. Gould and Lou Morrison

West Virginia
59. M. E. Gallegly

Wisconsin
60. Paul E. Hoppe

CANADA

Ontario
61. G. C. Chamberlain
62. W. G. Kemp

PHILLIPPINES
63. O. A. Sulit and A. G. Newhall
64. F. T. Orillo and A. G. Newhall
65. D. M. Nora and A. G. Newhall
66. F. A. Aquilizan and A. G. Newhall
67. H. Bergonia and A. G. Newhall
68. R. S. Cortado and A. G. Newhall

Some of the Newer Chemicals Tested 1956

(See also lists in Results of 1953 and 1954 tests.

Agristrep—streptomycin sulfate—Merck & Co.

Agrimycin 100—streptomycin 15% and terramycin 1.5%—Pfizer Co.

Agrox—phenylmercuriurea 6% — Chipman Chemical Co.

Alcufe—neutral complex salt of aluminum, copper, and iron hydrates—?

Anisomycin — antibiotic — Chas. Pfizer Co.

Anticarie—hexachlorobenzene 40%—H. P. Rossinger Co.

Bedrench—Allyl alcohol 81% + ethylene dibromide 11.9% — Niagara, ("Weedrench") Larvacide Prod.

B74—antibiotic—Univ. of Wisconsin

Calumet Cu Oxide—brown cuprous oxide—Calumet & Hecla Inc.

Captan 859 and 877—a tetrahydro analogue of captan—California Spray Chemical Co.

Cerenox—oximino — N-benzamidopiperidine—Bayer Co. (Germany)

Ceresan D—ethylmercury acetate .6% and dihydroxypropylmercaptide 2.8% —E. I. du Pont de Nemours & Co.

Ceresan M—ethylmercury — p-toluene sulfonanilide 7.7%—E. I. du Pont de Nemours & Co.

Ceresan S—Ceresan D more concentrated—E. I. du Pont de Nemours & Co.

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Ceresan 365—phenyl and ethylmercury acetates 3.39% and 2.35%—E. I. du Pont de Nemours & Co.

Chem Bam—Nabam 19%—Chemical Insecticide Corp.

Chipman 42—methoxyethylmercury acetate + aldrin—Chipman Chemical Co.

Chipman 49—methoxyethylmercury borate—Chipman Chemical Co.

Chipman 51—methoxyethylmercury acetate + ethylmercury acetate—Chipman Chemical Co.

Chipman 52—methoxyethylmercury borate + ethylmercury acetate — Chipman Chemical Co.

Chipman HCB 80—hexachlorobenzene 80%—Chipman Chemical Co.

Chlorothion — dimethyl-O — chloronitrophenyl. phosphorothionate—Chemagro Corp.

CMZ—neutral copper 29% + manganese 12% + zinc 3%—Kilgore Seed Co.

Crag 6428 — ? — Carbide and Carbon Chemicals Corp.

Darvan — dispersing agent — St. Louis Lead

Delsan A-D—Thiram 60% + Dieldrin 12.75%—E. I. du Pont de Nemours & Co.

Diazinon—a thiophosphate insecticide—Geigy Chemical Co.

Diclone—dichloronapthoquinone ("Phygon")—U. S. Rubber Co.

Dorlone—ethylene dibromide 18% + dichoropropenes 75%—Dow Chemical Co.

Dow HCB M476 — hexachlorobenzene 40%—Dow Chemical Co.

Dyrene—see Kemate

Elgetol—sodium, dinitro-o-cresoxide — Standard Chemical Co.

Emmi—ethylmercuri, tetrahydroendomethane hexachlorophthalamide (formerly 50-CS-46 or PX332)—Velsicol Corp.

Filipin—antibiotic—Upjohn Co.

Fumazone — dibromo chloropropane — Dow Chemical Co.; ("Nemagon") of Shell Chemical Corp.

Gallotox—phenylmercury acetate 7%—Gallowhur Chemical Co.

Genite—insecticide—dichlorophenol ester of benzene sulfamic acid—General Chemical Co.

Glyodin—heptadecyl, amidazoline acetate 34%—Carbide & Car. (Crag 341)

Griseofulvin—antibiotic—Merck & Co.

Gytrete—phenylmercury acetate—

Hexadane — hexachlorobenzene + lindane—Miller Products Co.

Ialine—colloidal sulfur 40%—Burt Boulton & Haywood Ltd.—England

Karathane—dinitro octyl phenyl crotonate — Rohm & Haas Co. ("Mildex") Larvicide Products

Kemate—("Dyrene") dichloro—chloranilino triazine — Chemagro Corp. (old B622—Pittsburgh Coke & Chem.)

Kolo 100 Special—Bentonite Sulfur 93% and Phygon 7%—Niagara Co.

Liquiphene — phenylmercury acetate — Vineland Chemical Co.

Malathion—dimethyl dithiophosphate of diethyl mercaptosuccinate—American Cyanamid Co.

Mema — methoxyethylmercury acetate 11%—Chipman Chemical Co.

Mema-sol — methoxyethylmercury acetate 24%—Chipman Chemical Co.

Mergamma—phenylmercuriurea 3.4% + Lindane 40%—Chipman Chemical Co.

Mer-kote—phenylmercury acetate 5.4% —Stauffer Chemical Co.

Mer-lin — phenylmercury acetate 1.7% + Lindane 37% — Stauffer Chemical Co.

Mer-sol—phenylmercury acetate—Stauffer Chemical Co.

Mesulfane—N—methane — sulfan—N—trichloromethano — mercapto — 4 — chloronilide—Geigy Chemical Co.

Metasan OP—phenyl mercury oxyquinolinate 13% hg—Metalsalts Corp.

Metasan E and M—phenyl mercury oxyquinolinate 13% hg—Metalsalts Corp.

Metasol E and M—phenyl mercury oxyquinolinate 13% hg—Metalsalts Corp.

Microgel—basic copper sulfate

Mycostatin—antibiotic—Squibb

Mylone — dimethyltetrahydrothiadiazine thione—Carbide & Carbon Chemicals Co. (Crag 974—Stauffer N521)

Nemagon — dibromo chloropropane — Shell, (DBCP) (old Shell 1897)

Norsulfane—N—methano — sulfan—N—trichloromethano—mercapto — anilide —Geigy Chemical Co.

No Bunt — hexachlorobenzene 40% — Chipman Chemical Co.

Oligomycin—antibiotic—Univ. of Wisc.

Omadine—pyridinethione 1 oxide (Fe, Mn, or Zn salt) — Olin Mathieson Chemical Co.

Omazene—copper dihydrazinium sulfate 50%—Olin Mathieson Chemical Co. (466)

ONCB—orthonitrochlorobenzene — Monsanto Chemical Co.

Ortho Seed Guard—Captan 25% + Lindane 25%—California Spray Chemical Co.

Ortho Cop 53 — basic copper sulfate 98%—California Spray Chemical Co.

Orthorix—calcium polysulfides 26%—California Spray Chemical Co.

Pano—drench 4—cyano methylmercury guanidine—Panogen Co.

Panodrin—cyano methylmercury guanidine .4% + aldrin 25%—Panogen Co.

Pomogreen—sulfur 40% + ferbam 7% + methoxychlor 5% + BHC 1%—Niagara

Pyridinethione — see Omadine — Olin Mathieson Chemical Corp.

Phytomycin—antibiotic—Olin Mathieson Chemical Corp.

PCNB—see Terraclor

Phix — phenylmercury acetate 22% — Chemley Products Co.

Phybam—sulfur + ferbam + phygon—Pittsburgh Plate Glass Co.

PRD—dichlorotetrahydrothiophene dioxide—Diamond Alkali Co.

Puraseed—phenylmercury formamid 6% + anilinocadmium lactate 6%—Gallowhur Chemical Corp.

Rimocidin—antibiotic—Chas. Pfizer

Sanocide — hexachlorobenzene 40% — California Spray Chemical Co.

Santobrite—pentachlorophenol — Monsanto Chemical Co. (Dowicide 7, Santophen 20)

S. D. D.—Sodium dimethyldithio carbamate—B. F. Goodrich Co.

Setrete—phenylmercury acetate 7% — W. A. Cleary Corp.

Smut B Gon—7% phenyl mercury acetate—California Spray Chemical Co.

Telone—(soil fumigant) 95% dichloro propenes and related C hydrocarbons —Dow Chemical Co.

Tennam—aqueous suspension of manganous dithiocarbamate — Tennessee Copper Corp.

Terraclor — pentachloronitrobenzene — PCNB — Olin Mathieson Chemical Corp.

Thioneb—polyethylene thiuramdisulfide —Naugatuck Chemical Co.

Thylate — sodium salt of tetramethylthiuram disulfide—E. I. du Pont de Nemours & Co.

Vapam—N—methyl dithiocarbamate dihydrate—Stauffer Chemical Co. (old N869) also E. I. du Pont de Nemours & Co.

Vancide M — manganese salt of dimethyldithio carbamic acid and 2 mercaptobenzothiozole—R. T. Vanderbilt Co.

Vancide A—Vancide M + ferric salts—R. T. Vanderbilt Co.

Vancide Z—Zn Salts—R. T. Vanderbilt Co.

Wing Stop B—Sodium dimethyl dithiocarbamate — Goodyear Rubber Co. ("S.D.D.")

Zinc Oxide—ZnO—St. Joseph Lead Co.

A 201 and 203—?—Panogen Co.

A 670—a systemic copper — Pittsburgh Coke & Chemical Co.

Exp. 8—"Quinex" — organo mercury — General Chemical Co.

C 13-125—?—Gallowhur Chemical Co.

CP 11354—?—Monsanto Chemical Co.

CP 11356—?—Monsanto Chemical Co.

DN 289—insecticide—Dow Chemical Co.

MC 2—Methylbromide—Dow Chemical Co.

M 22—maneb—Rohm & Haas Co.

M 501, 5, 6, 7, 8, 9, and 510—all hexachlorobenzenes—Dow Chemical Co.

N521—see Mylone—Crag 974—Stauffer Chemical Co.

OR 301, 302, 303—hexachlorobenzenes—California Spray Chem. Co.

RE 3681 and 3682—8% hexachlorobenzenes—California Spray Chem. Co.

TD 40—dinitrobenzene thiocyanate 40% Penn Salt Co.

UF conc 85—Urea 26% formaldehyde 59%—Allied Chem. Co.

V-C-13—dichlorophenyl — diethyl phosphorothiate — Vir. Carolina Chem. Corp.

Y 2867—HCE—hexachloroethane 20%—Monsanto Chemical Co.

Y 2865—HCE + 1254—hexachloroethane + aroclor—Monsanto Chemical Co.

Y 2866—HCE + 5460—hexachloroethane + aroclor—Monsanto Chemical Co.

1114, 1122, 1143, 1180—Puratized—Gallowhur Chemical Co.

1563, 1564, 1565—zinc, manganese and ferric salts of 2 pyridinethione—Olin Mathieson Chemical Corp.

1843—?—Chemagro Corp.

2153—abietylamine sulfate 65%—Hercules Powder Co.

4124—analog ? of chlorothione—American Cyanamid Co.

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5223—?—American Cyanamid Co.

8599—?—American Cyanamid Co.

9116—heterocyclic N and S compound—Carbide & Carbon Chemicals Co.

14307—?—American Cyanamid Co.

27810 and 28810—?—Geigy Chemical Co.

6710 — 1,2 dithio-4,7-diazocyclooctane-3, 8-dithione 70% — Carbide & Carbon Chemicals Co..

7443 — S,S'-Dimethylxanthogenethylene-bis dithiocarbamate 70% — Carbide & Carbon Chemicals Co.

Tree Fruits

Apple

Illinois Report

SCAB

In a comparison of eight materials on eight replicated single tree plots sprayed with a full field schedule including lead arsenate and DDT for insect control at appropriate times at Urbana, Ill., Powell reports the most promising material to be American Cyanamid Co. No. 5223, which at two pounds was 100% effective on foliage and fruit under conditions which brought nearly 100% infection in the checks. This material is thought to act both as protectant and eradicant. No. 11356 needs retesting at higher dosage rates. No. 1180 and No. 1114 formulations were less effective in 1956 than 1955. The first material caused severe foliar spotting and the next two, light foliage injury and fruit russetting. All materials gave control early but with many of them considerable secondary infection came in later. (Table 1.)

Pennsylvania Report

SCAB

Seven applications of eighteen fungicides, mostly new experimental materials resulted in some striking control in Pennsylvania according to Fink and Zeiders. Again American Cyanamid's No. 5223 topped the list and at only one half pound. Malathion was the insecticide in all sprays. Several materials caused some phytotoxic effects as noted in Table 2.

In a test of several formulations of Glyodin 341 versus captan in Pennsylvania, the Captan alone was a little better than the glyodin combinations on both Stayman and McIntosh varieties. There were many infection periods in 1956 and eight applications of Captan paste held scab on terminals of the more susceptible variety down only to 38% with 100% in the checks according to Fink. (Table 3)

TABLE 1

Control of Apple Scab at Urbana, Illinois (18)

Tmt./100 gal.	% Foliage Infection	% Fruit Inf. on Rome	Foliage Injury
GCEF, 80 cc	100	7.8	severe
11354, 1 lb. Monsanto	100	13.0	light
11354, 2 lbs. "	65	3.2	light
11356, 1 lb. "	100	7.4	none
11356, 2 lbs. "	81	6.8	none
H 2153, 1 lb.	100	14.2	none
H 2153, 2 lbs.	100	28.2	none
AC 5223, 1 lb.	61	3.8	none
AC 5223, 2 lbs.	8	.6	none
1180 S, 1 pt. Puratized	75	5.0	none
1180 P, 2 lbs. "	100	29.8	none
1114 P, 2 lbs.	100	45.6	none
Captan (50%), 2 lbs.	100	9.8	none
Water	100	94.2	none
L.S.D. at 5% level		12.6	

TABLE 2

Apple Scab Control and Foliage Injury From Experimental Fungicides in Pennsylvania (46)

Fungicides	Lbs./100 g	% Leaf Spurs 6-11	Scab On Term. 7-9	Foliar Injury
American Cyanamid 5223	½	1.0	0	
"	1	1.0	0	
"	1½	1.0	0	
American Cyanamid 8599	½	8.6	27.7	(General Chlorosis and browning)
"	1	5.3	2.3	
Carbide and Carbon 9242	1 qt.	17.0	32.0	
" 9846	1 qt.	17.3	48.7	(Chlorotic spots)
" 10157	1 qt.	18.0	13.0	
" 10393	¾	25.0	27.0	
Carbide and Carbon 9116	1½	13.6	50.0	
Omadine Fe	1	18.6	3.0	
Monsanto CP 11354	1	9.3	9.0	Extreme burning
Monsanto CP 11356	1	11.6	5.0	
Thioneb	¾	14.0	13.0	
Puratized 1143	2	13.0	3.0	
Puratized 1122	2	9.6	5.3	
Puratized 1180	2	8.6	3.6	
Pen. Salt TD-DNT-40	2	6.0	1.0	Slight marginal chlorosis
Captan + sulfur paste	1 + 4	9.6	1.0	
Captan paste + sulfur paste	1 + 4	14.6	2.0	
Captan	2	4.6	2.0	
None		35.6	100.0	
L.S.D.		13.8	32.1	

TABLE 3

Apple Scab Control With Different Formulations of Glyodin (341) and Captan in Pennsylvania (45)

Fungicide	Rate/100 gallons Through Calyx, then covers	% Lvs. With Scab On Stayman Spurs	Stayman Term.	McIntosh Spurs	McIntosh Term.
341 + Tag then 341	1 qt. + ½ pt. then 1 qt.	6.8	10.4	23.3	69.9
Captan 50W	2 lbs.	2.3	2.7	13.7	40.0
341AR + Tag then 341AR	1 qt. + ½ pt. then 1 qt.	12.7	9.3	23.6	57.1
Captan S	2 lbs.	3.8	3.1	21.2	49.8
341PP + Tag then 341PP	1 qt. + ½ pt. then 1 qt.	8.6	7.1	26.2	58.4
Captan paste	2 lbs.	2.9	3.6	18.6	38.4
341GR + Tag then 341GR	1 qt. + ½ pt. then 1 qt.	5.4	4.9	34.3	53.1
Captan 50W + Mag 70 Sulfur	1 lb. to 6 lb. then 2 lb.	5.5	5.0	26.2	41.2
Check		52.1	98.0	63.7	100.0
L.S.D.		16.9	8.1	15.6	20.2

New Hampshire

Scab

In a series of orchard tests in New Hampshire by Rich using seven to ten gallons of dilute spray per tree, weekly sprays in general gave a little lower control than sprays applied before infection periods. Both schedules were more effective than a schedule in which applications were made just after each infection period even though in the latter case, mercurial eradicant sprays were used. The ratings of each material can be seen by the amounts of leaf and fruit scab on MacIntosh given in each table below. (Tables 4, 5, 6.)

Ohio Report

In a season so favorable for scab in Ohio that no unsprayed fruits remained unaffected, Winter reports fine control on the variety Rome with several materials or combination programs. On this variety none were phytotoxic but Glyodin + lead arsenate (without lime). In another test of three materials on Cortland, some russeting from seven applications of Phix (phenyl mercury acetate) occurred although it gave complete control. Such russetting was noted for the first time in 1956. Captan, and Thylate followed by Manzate, were nearly as good while Thylate alone was less effective. (Table 7.)

New York Report

In a place where scab was not too severe, a comparison of several fungicides by Palmiter at New Paltz, New York revealed the two most satisfactory as wettable sulfur + Diazinon + DDT, Phybam, DDT and Crag 341 + Arsenate of lead + Ferric Sulfate. The Ferrous form of sulfate was phytotoxic and gave the poorest control. Crag alone also was phytotoxic, but six of the ten fungicidal combinations are deemed recommendable. (Table 8.)

TABLE 8
Apple Scab Control in Hudson Valley, New York (29)

Fungicide	Rate per 100 gal.	Control rating	Safety rating	Recommendable
Crag 341 + Ferric Sulf. + Ld.Ars.	2 pt.	2	S	X
Crag 341 + Ferrous Sulf. + Ld.Ars.	2 pt.	10 U	Tox.	
Crag + Ld. Ars.	2 pt.	4	Tox.	
Wettable S + Diazinon + DDT	6 lbs.	9 U	S	X
Phybam + DDT	4 lbs.	3	S	
Phybam S + Diazinon + DDT	4 lbs.	1	S	X
Vancide A + DDT	1½ lb.	8	S	X
Vancide A + Diazinon	2 lbs.	7	S	X
Thylate + Diazinon + DDT	2 lbs.	5	S	X
Thylate paste + Diazinon	1290 cc	6	S	

TABLE 4
Pre-infection Schedule of Apple Scab Control on McIntosh at Durham, N. H. (23)

Fungicide	Lbs./100 gal. Early	Covers	% Leaf Scab	% Fruit Scab
Sulfur	8 lbs.	3 lbs.	8	4
Dichlone 50%	¼ lb.	1 lb. captan	1	½
Dichlone	⅛ lb.	1 lb. captan	1	2
Captan 50W	2 lbs.	1 lb. captan	2	3
Captan	1 lb.	1 lb. captan	2	4
Captan paste	2 lbs.	1 lb. paste	2	4
Glyodin	1 qt.	1½ pt.	5	9
Thylate	2 lbs.	1½ lbs.	1½	½
Vancide A	2 lbs.	1½ lbs. Van M	11	3

TABLE 5
Weekly Schedule of Apple Scab Control on McIntosh at Durham, N. H. (23)

Fungicide	Lbs./100 gal. Early	Covers	% Leaf Scab	% Fruit Scab
Dichlone 50%	¼ lb.	1 lb. captan	1	3
Captan 50W	2 lbs.	1 lb. captan	2	6
Glyo+Phix	1 pt. + 2 oz.	1½ pts. glo.	1	3
Glyo+Pur Agr.	1 pt. + ½ pt.	1½ pts. glyo	2	2
VanA+Pur Agr.	1 lb. + ½ pt.	1½ lbs. VanM	3	7
Glyo+Exp No. 8	1 pt. + ⅛ pt.	1½ pts. glyo	2	5

TABLE 6
Post-infection Schedule of Apple Scab Control on McIntosh at Durham, N. H. (23)

Fungicide	Lbs./100 gal. Early	Covers	% Leaf Scab	% Fruit Scab
Pur. Agr. Spr.	1 pt.	1 lb. captan	12	11
Phix	2 oz.	1 lb. captan	9	12
Liquiphene	⅛ pt.	1 lb. captan	5	14
Exp. No. 8	⅛ pt.	1 lb. captan	11	16
Check			76	100

TABLE 9
Apple Scab Control at St. Catharines, Ontario (61)

Materials	Rate/100 g	Ex. Pref.	Recommended
captan 50W	2 lbs.	1	X
zineb	2 lbs.	1	—
Thioneb	2 lbs.	1	—
Crag Fungicide	1 qt.	2	X
Phygon XL	2 lbs.	3	X
Nirit	2 lbs.	4	—
Vancide A-M	2 lbs.	5	—
captan analogue 859	2 lbs.	6	—
Consul	10 lbs.	7	X

TABLE 7
Apple Scab Control at Wooster, Ohio (38)

Fungicide and rate	% Fruit Scab at Harvest McIntosh	Cortland	Rome
Check	95.6	80	100
Thioneb 50W, 2 lbs. thru 1st cover, then 1 lb.	1.6		
Thylate 2 lbs. thru 1st cover, then 1 lb.	2.2		
Thylate 2 lbs.		4.1	
Thylate 1½ lbs.		5.1	
Thylate 1 lb. + Manzate ½ lb. thru 1st cover, then Thylate 1 lb.		2.0	
Phix 4 oz. thru 1st cover, then Captan 1 lb.		0.0*	0.0
Captan 2 lbs. thru 1st cover, then Captan 1 lb.		1.0	1.2
Am. Cyan. 5223 1 lb.			.1
Am. Cyan. 5223 1½ lb.			0.0
Panogen 1 pt. thru 1st cover, then Captan 1 lb.			.5
Panogen ½ pt. thru 1st cover, then Captan 1 lb.			1.5
Glyodin 2 lbs. thru 1st cover, then 1 pt.			0.1*
Vancide A 2 lbs., then Vancide M 1½ lbs., then M 1 lb			1.0
Gen. Chem. EF. 8, 2 oz. thru 1st cover, then Captan 1 lb.			0.0

* Russeting of fruit

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LISTENING *Post*

Control of Early Maturity Disease of Potatoes by Soil Treatment*

This department, which reviews current plant disease and insect control problems, is a regular monthly feature of AGRICULTURAL CHEMICALS. The comments on current plant disease problems are based on observations submitted by collaborators of the Plant Disease Epidemics and Identification Section, Horticultural Crops Research Branch, U. S. Department of Agriculture, Beltsville, Md.

By Paul R. Miller

ROY A. Young of the Oregon Agricultural Experiment Station reports results of experiments on chemical control of the early maturity or early dying disease of potatoes, attributed principally to the fungus *Verticillium albo-atrum*. Affected plants turn yellow, cease growing and die before tubers reach marketable size. The time of appearance of symptoms and the severity of disease are dependent upon summer temperatures. In south central Oregon, symptoms usually appear soon after August 1 or within 8 to 10 weeks after emergence of sprouts. In some soils that have been used for potato culture for many years the disease may occur in large areas in a field, or an entire field may be affected. Control has been difficult since neither suitable resistant varieties nor effective chemicals that could be used economically have been available.

The trials reported were conducted to determine whether or not the early maturity disease could be controlled by treatment of infected soil with certain fungicidal chemicals or by combinations of soil and seed-piece treatment. Vapam (sodium N-methyl dithiocarbamate dihydrate) was selected because preliminary trials showed it to be an excellent fungicide. PCNB (pentachloronitrobenzene) was used because of its long residual effect, although it has been relatively ineffective against *Verticillium* and *Fusarium* species. Since earlier trials showed that preplanting dip treatments of cut seed pieces in dichlone (1 pound in 10 gallons) or Semesan Bel (1 pound in 10 gallons) resulted in significant decreases in the incidence of wilt, various seed piece treatments were included in the trial.

* Plant Dis. Reptr. 40: 781-784. Sept. 1956.

Experimental Methods

A section of an infested field, 200 by 600 feet, was divided into 12 strips 200 by 50 feet. Each of the following materials was applied to three randomly selected strips: Vapam 190 pounds per acre, PCNB 100 pounds per acre, or Vapam and PCNB. Three strips were left untreated. Prior to treatment the soil was plowed, disced and packed. PCNB (75% wettable) was mixed with two parts of gypsum, applied to the soil surface with a fertilizer spreader, and then double-disced into the soil. Vapam was injected into the soil to a depth of approximately 6 inches, using a blade injector. The soil was packed wtih a roller cultipacker immediately after treatment. The plot was disced 5 days after treatment and planted with Russet Burbank seed potatoes 10 days after treatment.

At the time of planting, the plot area was divided into three replicate strips approximately 60 by 600 feet, and four rows of each of the following treatment combinations were planted in each replication:

1. No treatment
2. Fertilizer 100 N, 50 P, 50 K
3. Fertilizer, plus treatment of cut seed pieces in dichlone (1 pound to 10 gallons)
4. Fertilizer, plus treatment of cut seed pieces in Semesan Bel (1 pound to 10 gallons)
5. Fertilizer, plus treatment of cut seed pieces in Semesan Bel (1 pound to 10 gallons), plus heptachlor (2 pounds to 100 gallons)

Fertilizer was side-dressed at the time of planting and at the last cultivation. Seed-piece treatments consisted of a 1-minute dip of freshly cut seed in the fungicides or mixtures indicated. Plots were treated on May 9, planted on May 19, and harvested on September 29. Observations were made on emergence, stand, incidence of weeds, and disease control as indicated by top symptoms and yield.

Results

Emergence and Stand: Emergence was delayed in plots treated with PCNB but within 3 to 4 weeks after emergence, differences could not be observed except in plots treated with PCNB alone. In this experimental planting seed-piece decay was not prevalent, and there were no significant differences in stand as a result of either seed or soil treatments.

Incidence of Weeds: Counts made of the incidence of various weeds in the soil treatment plots on August 3 are shown in Table 1. Both Vapam and PCNB showed marked herbicidal activity but PCNB was more effective than Vapam. Pigweed and lambsquarter were eradicated completely by PCNB and the incidence of mallow, filaree, and grasses was reduced markedly as compared to the untreated check. Vapam was most effective against pigweed, lambsquarter, and the grasses.

Disease Control: Significant disease control was obtained by both seed treatment and soil treatment. The most striking effects resulted

from soil treatment with Vapam as may be seen in Figure 1, an aerial photograph of the entire plot. Plants growing in soil treated with Vapam remained green long after plants in the untreated soil and PCNB-treated soil had become yellow and dry. The light streaks running lengthwise of the plot are the untreated strips that did not receive a side dressing of fertilizer.

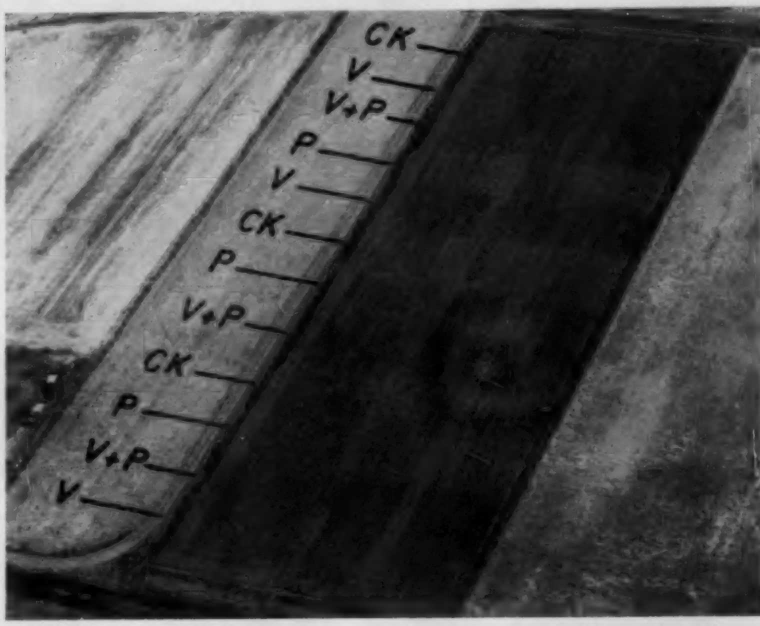
The effectiveness of Vapam in controlling the early maturity disease was also strikingly reflected in yield data (Table 2). Yields were approximately quadrupled in plots treated with Vapam as compared with no treatment and fertilizer alone and more than double the yields from fertilizer plus seed treatment.

In the untreated and PCNB-treated plots, seed-piece treatment with dichlone or Semesan Bel resulted in significant increases in yield as compared with the fertilizer treatment; however, there were no significant differences between the fungicidal seed treatments or due to the addition of heptachlor to the mixture.

PCNB and fertilizer also significantly increased yields, as compared with fertilizer alone, although treatment with PCNB alone did not result in a significant increase over the untreated check.

Discussion

Injection of 190 pounds of Vapam into the soil 10 days prior to planting resulted in striking control of the early maturity disease of potatoes attributed principally to *Verticillium albo-atrium*. Application of PCNB alone or in combination with Vapam had little effect. In view of other verbal reports of failure to control Verticillium-induced diseases with Vapam, it is suggested that the method of application is of great importance in obtaining satisfactory control. With the blade applicator used, the Vapam was sprayed in a continuous layer approximately 6 inches deep in the soil, whereas the usual method of application has been to apply the Vapam in water to the surface of the soil and to allow the downward percolation to carry the Vapam into the soil.



Aerial photograph of experimental plot. Light areas indicate dead or yellow plants, dark areas green plants. Letters designate soil treatments as follows: CK, untreated check; V, Vapam; V-P, Vapam—PCNB; P, PCNB. Light streaks are no fertilizer treatment.

At present prices, these data do not represent economic control of Verticillium wilt of potatoes. However, the data are of interest because they demonstrate that Vapam can be used effectively as a soil fumigant to combat a soil-borne vascular fungus, and because the method of application is adaptable to large scale operations. Considering the multiple benefits of disease control and weed control, similar use of Vapam on high acre-value crops would be very practical even at present levels of cost.

TABLE 1.
Effect of soil treatment on incidence of various weeds.

Treatment	Total number of weeds in 6 20-foot sections of row				
	Pigweed	Lambsquarter	Mallow	Filaree	Grasses
Vapam	2	1	51	59	3
PCNB	0	0	17	22	5
Vapam and PCNB	0	0	12	16	2
Untreated	29	14	40	128	33

TABLE 2.
The effectiveness of fertilizer, seed treatment, and soil treatment in controlling the early maturity disease of potatoes, as indicated by yield.

	Total yield from 18 30-foot sections of row in soil*			
		Treated with		
Treatment at planting	Untreated	PCNB	Vapam	Vapam + PCNB
No treatment	74.5	80.5	330.3	378.5
Fertilizer	152.0	257.5	607.0	629.0
Fertilizer + Dichlone Seed Treatment	261.5	343.5	626.2	613.5
Fertilizer + Semesan Bel Seed Treatment	210.3	317.2	601.1	614.0
Fertilizer + Semesan Bel and Heptachlor Seed Treatment	217.0	350.5	602.0	662.5

* Differences between unbracketed figures in each column significant. No significant differences between figures within brackets.

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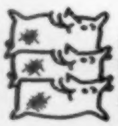

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1956 Fall Boll Weevil Hibernation Survey

This column, reviewing current insect control programs, is a regular feature of AGRICULTURAL CHEMICALS. Mr. Dorward is head — Plant Pest Survey Section, Plant Pest Control Branch, U. S. Department of Agriculture. His observations are based on latest reports from collaborators in the U.S.D.A.'s pest surveys throughout the U. S.

By Kelvin Dorward

COOPERATIVE surveys to determine the number of cotton boll weevils going into hibernation during the fall of 1956 have been completed in several states. In Louisiana, Mississippi, North and South Carolina counts are below those of the previous year. However, with favorable weather conditions, sufficient numbers are in hibernation to be of concern early in the coming season. Counts in Virginia and Georgia are higher than in the fall of 1955 but are comparable with those in the other states.

Ground trash samples to be inspected to determine the number of live boll weevils in hibernation are collected near the edge of cotton fields. In most instances the states were divided into areas made up of one or more counties with similar ecological conditions. It had previously been determined that 90 samples obtained from such an area would give statistically sound information while at the same time reduce the amount of work required.

In Louisiana live weevils were found in nine of the 12 parishes from which samples were collected for a State average of 1344 weevils per acre of trash. This was only about one-seventh of the average count for the fall of 1955. Louisiana was divided into four areas with the northeastern area consisting of East Carroll, Madison, and Tensas Parishes averaging 2596 live weevils per acre. Ground trash collected near Tallulah, Madison Parish showed an average of 2622 weevils per acre, which was about one-fifth the number found in the fall of 1955 and slightly under the 20 year average of 2914 for that particular section. The north central area consisting of Richland, Morehouse and Ouachita Parishes, averaged 1255 per acre. The average in the northwestern area; Natchitoches, Bossier and Red River Parishes, was 628 per acre and in the south central area; St. Landry, Rapides and Avoyelles Parishes, 528 live weevils per acre.

The average number of live boll weeils per acre of ground trash for the State of Mississippi was 2091, compared with the 5054 found in the fall of 1955. Collections were made in four areas of Mississippi. The lower delta area consisting of Sharkey, Issaquena, Yazoo and Humphreys Counties averaged 2379 weevils per acre. The average in the central delta area; Washington, Bolivar, Sunflower and Leflore Counties, was 1814 live weevils per acre. In the north delta area; Coahoma, Tunica, Quitman and Panola Counties, 2516 weevils per acre were found and in the hill area; Amite, Madison, Noxubee and Monroe Counties, the count was 1655.

Five areas were established in the combined States of South Carolina, North Carolina and Virginia for the boll weevil hibernation survey. Area 1 which consisted of Orangeburg, Dorchester and Bamberg Counties, South Carolina had an average of 3712 live weevils per acre of trash. Area 2; Darlington, Marlboro, and Florence Counties, South Carolina and Scotland County, North Carolina had an average of 8,635 live weevils per acre. Area 3; consisting of Anderson, Greenville and Spartanburg Counties, South Carolina and Mecklenburg, Cleveland and Union Counties, North Carolina averaged 6,268 weevils per acre. The average was 4,815 in Area 4; which was comprised of Nash, Wilson, Franklin and Edgecombe Counties, North Carolina. All counties, Southampton, Nansemond, Mecklenburg and Brunswick, which made up Area 5 were in Virginia. The average in this area was 4,169 live weevils per acre of ground trash.

For comparative purposes the 1956 fall count in Florence County, South Carolina was 5,757, while in 1955 it was 11,398 per acre. In only three years since 1938 (1949, 1952 and 1955) have the counts in Florence County exceeded those for 1956. The average for the State of North Carolina in the fall of 1955 was 4,146 live weevils per acre and for Virginia was 1,476.

In Georgia hibernation counts were made in four areas, with the State average being 1,936 live weevils per acre of ground trash as compared with 799 in the fall of 1955. This is also higher than the average of 1,169 per acre for the six years that records have been taken The areas together with average counts are as follows: northwest (Gordon County) 2,904; north central (Spalding, Butts, Pike, Henry, and Lamas Counties) 2,299; east central (Burke County) 774; and south (Tift County) 1,355 live weevils per acre.

Forty-four ground trash samples were processed from one area in Arkansas (Hempstead, Columbia and Nevada Counties). The average for this area was 939 live weevils per acre of trash. The 1956 fall counts in Hempstead County were 1,398 per acre compared with a count of 1,717 in the fall of 1955.

Grasshopper Crop Up for 1957

Grasshopper surveys cooperatively by Federal and State entomologists to determine the outlook for 1957 have been compiled. In general, the situation is comparable to that expected in 1956 with an increase in the expected 'hopper crop in several states and only a slight increase in the expected rangeland problem but with a shift in the problems of several states.

North Dakota and Minnesota perhaps show the greatest increase of several states from a cropland prob-

(Continued on Page 110)


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WASHINGTON *Report*

by
Donald G. Lerch

Cornwell, Inc., Washington, D. C.
(Agricultural Chemicals Washington Correspondent)

HOW much money are you making? This is about the most important question any one can ask or that you can ask yourself. The question will be among those asked and answered during the forthcoming Spring Meeting of the National Agricultural Chemicals Association, March 6, 7, and 8 at the Fairmont Hotel, San Francisco, California.

The man with the timely answer to this question for every pesticide industry executive and leader will be Fred Shanaman, president, Pennsylvania Salt Manufacturing Company of Washington, who is scheduled to address the NAC convention Friday, March 8.

Judging by the general interest in the subject, Mr. Shanaman should speak to a full house. There are several reasons for the intense interest in this subject. One is that industry's costs for research on and marketing of pesticides are mounting. Secondly, other divisions of major corporations seem to be showing more profit per dollar of investment. This situation puts the management of pesticide divisions in a very delicate position.

Every corporation has its own way of doing business, and with some companies diversification is most important. In these situations, even though the pesticide divisions are not showing comfortable profits, they do represent an important source of income in broadening the base of corporate activity. However, every operation has to be weighed and measured, and executives of pesticide operations are no exception.

Here are some of the reasons why management is concerned. Washington is making it more and more expensive for companies to develop and market pesticides. While every company wants to abide by the many laws, there is the feeling that some of the interpretations being given the law cause unnecessary expense. This is born out by opinions of government leaders here in Washington who admit that government demands for data are becoming excessive in some instances.

Another reason for concern is the need to keep reminding Washington of the great need for farmers to increase efficiency of production by utilizing new developments, such as pesticides, fertilizers, antibiotics, improved machinery and the like. While we may find no alternative at present other than to ask farmers to reduce production, there's an important distinction between the size of the harvest and the yield per acre or the output per head of livestock. The fertilizer industry, in particular, is to be congratulaated for its effective work to impress upon everyone the importance of increasing the dollar income per acre by increasing yields.

It is probable that many companies will contribute material and information for the preparation of Mr. Shanaman's address. Through this type of presentation, the hard economic realistics of business life may well be brought to the attention of those in Washington who administer the laws.

Certainly NAC membership will be looking forward to the address of Fred W. Hatch, NAC president and manager of the Agricultural Chemicals Division of Shell Chemical Corporation. He will speak on the outlook for the agricultural chemicals industry. From his vantage point, Mr. Hatch probably sees a difficult future, but nonetheless a bright one. Certainly, his company along with several others have recently made substantial investments in research facilities which can only be repaid over years of successful operations.

* * * * *

"Impractical" is the term being leveled at the Food and Drug Administration by farm organizations in their opposition to the ruling of the Federal agency on the labelling of fruits and vegetables being marketed with legal residues of pesticides supplied primarily as a preservative. Some of the citrus people are downright agitated over the matter, and others in the fruit and vegetable industry see the Food and Drug Administration's decision as a definite threat.

Some Washington farm leaders see the possibility of an impasse and feel they may have to take the matter to Congress in order to get it straightened out. If the matter does reach the Hill, it may open up a number of questions which are dangling just outside the provisions of the Miller Law.

Essentially the Food and Drug Administration contends that pesticides, in this case fungicides, that are applied primarily for the purpose of preserving a commodity come under the provision of the Food and Drug law dealing with preservatives. Others claim that as long as any residue does not exceed the tolerances required for pesticides — that no further labelling or action is necessary.

Imagine fresh fruit and vegetable counters of food stores filled with signs saying "Preserved with X Chemical." It could be done, but as long as the safety requirements of the Miller Law have been followed, those who oppose the Food and Drug position question the need for this added work, expense and impediment to sales. Further developments on this matter are expected momentarily.

The Pesticide Registration Section of the U.S. Department of Agriculture is trying to dig its way out from the burden of reviewing labels in its files. Several target dates for releasing its report have already been missed.

Essentially the Section is getting together information on the status of labels with respect to the Miller Law. And, as you might expect, there are a lot of borderline cases, plus "iffy situations" sprinkled with whereas's and plenty of but's. However, the people in the section are plowing ahead and the chances are that shortly a report will be ready for release.

* * * * *

45,000 traps are awaiting stray Med-flies that everyone hopes are getting "real lonesome" as their tribe is systematically killed off with the most modern pesticide weapon known to man.

So successful has the campaign been that only about 35,000 acres are still undergoing treatment—a mere 5 per cent of the area at one time or another in the infested zones. What's more, the rate of decline is considered highly favorable, with the acreage under control dropping as much as 50 per cent in a 30-day period. However, Med-flies are still showing up and some reinfestations are being recorded. At this writing, it's not known how much, if any, additional money will be needed to complete the job. Right now, it appears that the funds in hand or in sight are almost enough.

* * * * *

The Food and Drug Administration may make a significant finding next month if it issues a decision on the amount of DDT which will be tolerated in the fat of animals. The tolerance is requested for fat and not for the forage which the animal consumes. A lot of attention is being given this matter by the Food and Drug Administration, and the outcome will be of major importance to the industry.

* * * * *

The National Agricultural Chemicals Association's latest educational radio project features a special transcription on safety. It is being mailed on a request basis to about 500 stations from coast to coast. Featured on the recording are: Dr. Henry van Zile Hyde, Chief, Division of International Health, Public Health Service, U.S. Department of Health, Education and Welfare — "SAVING LIVES WITH PESTICIDES"; Maynard H. Coe, Director, Farm Division, National Safety Council—"SAFE USE PRACTICES"; Dr. Lloyd W. Hazleton, Hazleton Laboratories—"RESEARCH FOR SAFETY"; and Jack Dreessen, National Agricultural Chemicals Association—"PESTICIDES AND WILDLIFE."

* * * * *

The anatomy of the continuing and growing drought covering large areas of the west, shows up in a series of wiggly lines which, if marked chronologically, date back 13 years. The present drought actually began in a section of central Arizona in 1944. By 1946 it included most of the western part of Texas, the southern half of New Mexico, and most of Arizona. By 1950 the central part of Oklahoma, northern New Mexico, and all of Arizona were included. From this point on the drought has crept gradually north by northeast, sweeping over much of Colorado, Kansas, Nebraska, and edging into parts of Iowa, and including areas of South Dakota and Wyoming.

This cancerous-like growth lies right beside the vital breadbasket of the nation. President Eisenhower's study of it merely brings to the attention of the public a situation which has been plaguing agriculture all these years, and which has largely been overlooked by the public, press, and by radio and television commentators who serve largely city audiences. The public is furthermore unfamiliar with the problem, and unimpressed with reports because of the continuous reporting of surplus problems.

Imagine what our food situation would be like were it not for the greatly increased yields resulting from the protection of crops by pest control chemicals, and the higher yields resulting from better fertility, and the further increases in yields resulting from better preparation of the seed bed resulting from the farmer's capability of capitalizing on short spells of good weather because of the increased efficiency and performance of farm equipment. Truly American industry and agricultural science, plus the farmer's ability to translate developments into practical use, have been responsible for largely nullifying the effects of the drought.

The Federal government is pouring in hundreds of millions of dollars of aid, in one form or another.

All manmade measures, however, have their limitations, and time appears to be running out in parts of the newly created dust bowl areas. A question is, how much longer these new developments and efficiencies can prevent really big blows from "scaring the pants off Congress" as happened in the 30's.

* * * * *

The need for trained agricultural workers is apt to become acute before it's remedied, according to many agricultural leaders. A recent address by W. H. Garman, Chief Agronomist, National Plant Food Institute, points out the problems in these words, "Because the annual demand is for 15,000 trained people in agriculture, and the colleges are turning out only 8,500, just about anybody can get a good job if he gets through college."

Garman continues with the question, "How many of our leading universities are making plans to expand their facilities according to anticipated needs? Based on population increases alone, the Educational Policies Commission recently estimated that by 1960 college enrollment would reach 3,221,000, almost a half million more students than in 1955. The 1965 enrollment was estimated at 3,953,000, an increase of 40% over 1955."

Further attention will be paid to this matter during the National Agricultural Chemicals Association's convention in San Francisco in the address, "Men for Agricultural Progress," by S. B. Freeborn, provost, University of California, and the address by Earl Coke, vice president, Bank of America, and his comments on "Money for Agricultural Progress.★★

Arcadian® News

Volume 2 — For Manufacturers of Mixed Fertilizers — Number 2

GETTING MORE NITROGEN INTO SUPERPHOSPHATE

New Ammoniation Methods Increase Nitrogen Take-Up!

Ammoniating superphosphate is the low-cost way of getting nitrogen into mixed fertilizers. For a long time the rate was 3 pounds of ammonia per unit of P_2O_5. However, through the use of modern methods and materials this rate has been greatly increased.

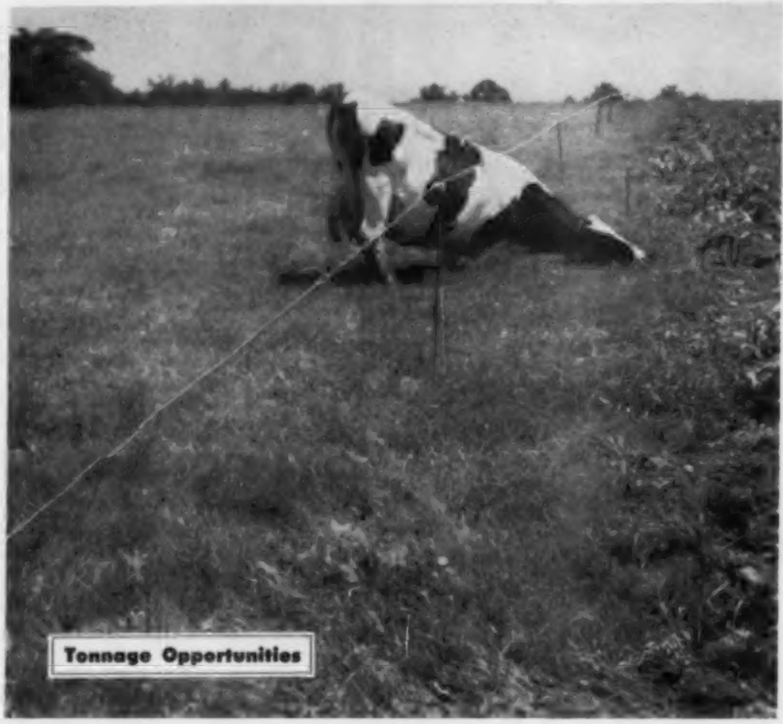
One unit of P_2O_5 in 20% superphosphate has been made to readily accommodate 5½ to 6½ pounds of free ammonia, without the aid of acid or the loss of nitrogen. Much good fertilizer is being made with ARCADIAN® Nitrogen Solutions supplying 1 unit of nitrogen for each 2 units of P_2O_5.

A new method of excessive ammoniation has also been developed which has been called "calculated loss." By this method, 1 unit of P_2O_5 retains 8 pounds of nitrogen by the application of 9 pounds in ammoniation. This means that 1 pound is lost but the 8 pounds that are retained are still very low in cost. Through the use of acid, much higher rates are obtained. Some fertilizer manufacturers are getting all the nitrogen into 10-10-10 fertilizer by this method.

High take-up of free ammonia by superphosphate is usually desirable in the manufacture of any mixed fertilizers. It is particularly desirable in the production of granular fertilizers. A high rate of ammoniation not only adds large quantities of low-cost nitrogen, it also generates heat at an opportune time in granulation.

Efficient ammoniation involves proper technique, equipment and materials. There is a complete line of ARCADIAN Nitrogen Solutions from which selections can be made adapted to particular conditions. Nitrogen Division Technical Men are experts in ammoniation. Their advice is free to customers.

Contact Nitrogen Division, Allied Chemical & Dye Corporation, 40 Rector Street, New York 6, New York.



Fertilizer for Grasslands Big Opportunity for Sales

How much more fertilizer could your dealers sell if every farm customer used 500 pounds per acre on his pastures and hay fields? Even in the less concentrated livestock areas, the extra sales would mount into a tidy profit. And some farmers *do use* this much fertilizer on grazing land—despite the fact that pastures are probably the most neglected soils, fertilizer-wise, of all farmland.

Take the case of one dairy farmer who uses 500 pounds of fertilizer per acre on hay, pastures and silage crops. The high quality and high yield of his roughage saves him $80 to $100 per cow per year on feed. And he saves labor too, because the cows harvest the crop.

More Grass—More Protein

In Wisconsin, a series of tests with 500 pounds of 13-13-13 or 12-12-12 per acre of pasture produces $45 to $60 worth of extra feed per acre. Average dry weight yield of pasture with fertilizer was over 2 tons per acre (more than 13,300 pounds green weight). Without fertilizer, pasture dry weight yield was only 1,300 pounds (4,300 pounds green weight). Protein content of the fertilized pasture ran over 18%—the equivalent of a good dairy ration.

In Texas, total cost of fertilizer applications on a 6-acre pasture for 5 years was $448. Compared to a 15-acre unfertilized pasture, this 6-acre plot with plant food produced 7% more milk, worth $613. Extra hay was worth $135. And the milk produced on the improved pasture tested 0.2% to 0.3% higher in butterfat. Over all, the $448 for improving a 6-acre pasture returned $1,044 above the income on the 15-acre unfertilized lot.

Benefits Native Grass

U.S.D.A. rangeland tests in Montana show similar improvement in range grazing. Range, fertilized with 90 pounds of nitrogen per acre, averaged 2,270 pounds of dry grass weight per acre each year, for six years. Without fertilizer, range produced only 748 pounds dry weight grass per acre. The percentage of protein in the grass also shot up, to provide extra feed benefits.

There is a big market for fertilizer right under the nose of the grazing cow. The more plant food we use on pastures, the better the livestock profits, and the better the fertilizer business.

Again we tell 3½ Million Farmers

Fertilizer Grows Farm Profits

Farming today requires a bigger investment per worker than most major industries. It takes money to make money farming.

Fertilizer is one of the lowest cost items the farmer buys, closer to prewar prices than anything else needed to grow crops. Fertilizer helps a farmer to get greater returns from his other investments in land, labor, machinery and other production costs.

The vital importance of fertilizer to the farmer is being brought to the attention of millions of readers of farm magazines in a powerful and continuing campaign conducted by Nitrogen Division, Allied Chemical & Dye Corporation.

Shown on the opposite page is one in a series of big, full-page advertisements appearing in farm magazines. Others have preceded it and more will follow. We trust that this campaign meets with your approval and we will greatly appreciate any comments or suggestions you may wish to send us.

Your fertilizer dealer wants to help you make more money...

The man helping the farmer test his soil in the photo above could be a County Agent or a Vo-Ag teacher. Actually he is a fertilizer dealer selling fertilizer with real service. He wants to supply his customer with the most profitable fertilizer for him to use—the fertilizer that will help every acre pay him more.

It's an important undertaking to provide you with the best value in fertilizers—the greatest crop-producing power for your money. That's why your dealer makes a careful study of crops and soils in your neighborhood. He knows the analyses and amounts of fertilizers used with success by other farmers. He studies Experiment Station results and Extension Service recommendations. He works with the County Agent and Vo-Ag teacher in crop and fertilizer demonstrations.

As costs mount for land, taxes, labor and machinery, your fertilizer dealer is eager to be of greater help to you. For fertilizer is more important to you now than ever before. It costs you less than anything else you have to buy to grow a crop. And average results show that it pays back several dollars for each one invested.

Talk it over with your fertilizer dealer. He wants to help you make more money this year. He wants your confidence and good will for many years to come.

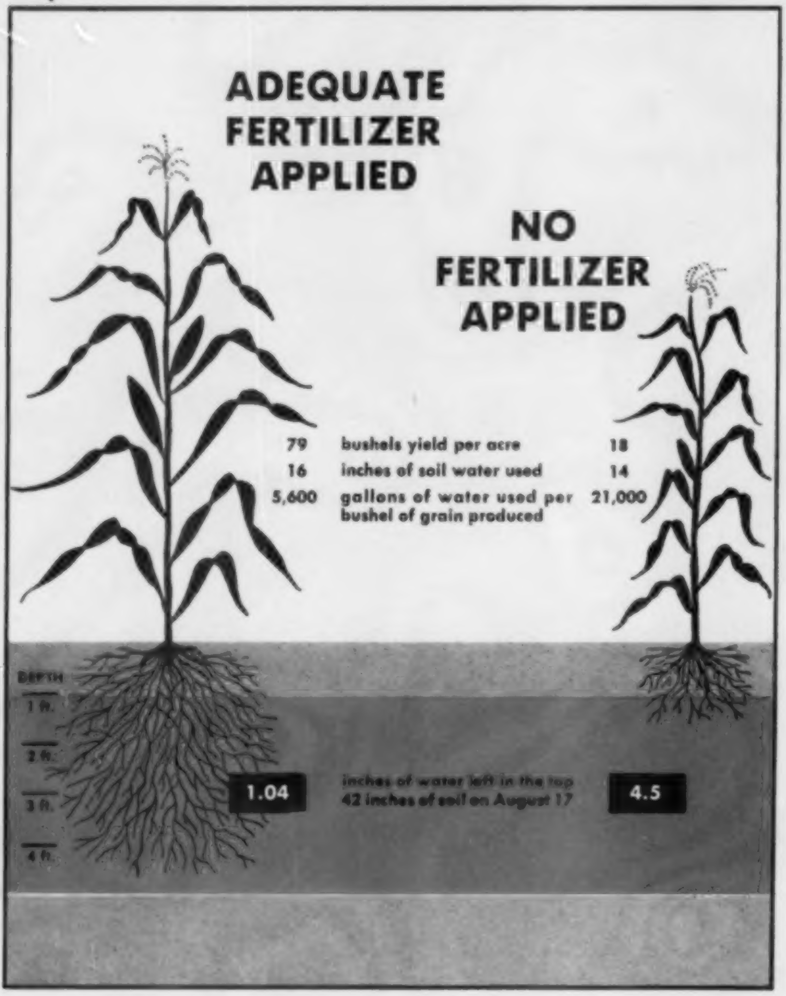
The fertilizer industry *serves the farmer. Nitrogen Division serves the fertilizer industry as America's leading supplier of nitrogen, the growth element in mixed fertilizers. Nitrogen Division, Allied Chemical & Dye Corporation, New York 6, N. Y.*

This fertilizer dealer sees how well the plow-down fertilizer he recommended has rotted down crop residues to feed the new crop.

This fertilizer dealer helps a farm family estimate yield on a well-fertilized field. The smiles indicate a money-making crop.

This fertilizer fieldman checks grain plots to note good grain growth without lodging. His findings will benefit many farmers.

FERTILIZER GROWS FARM PROFITS



Less Water Is Required Per Bushel of Corn When Crop is Well-Fertilized

Farmers and fertilizer dealers alike are too often pessimistic about the use of fertilizer in a dry season, or following a dry season. Agronomists point out that when subsoil moisture is good, adequate fertilizer enables the crop to grow vigorously and send its roots deep for water. This is shown in the diagram above, based on Missouri tests in a year with only five inches of rain during the growing season. Unfertilized corn left much soil moisture unused.

When subsoil moisture is low, a thinner stand of corn with plenty of fertilizer will produce bigger ears and more bushels than either a thin, unfertilized stand or a thick stand that would run out of water before earing out.

Corn following a drouth year will get considerable benefit from the previous year's plant food. But at best it gets 40% to 60% of the fertilizer held over in the soil. Later crops will get the rest. A good crop still requires plant food applied in the season of growth.

In the dry summer of 1955, 48 Wisconsin farms with well-fertilized corn produced 85 bushels per acre. The state average yield was only 50 bushels per acre.

Wheat Yields Better

Other crops, too, yield better on a limited water supply when well fertilized. North Dakota tests showed fertilized wheat matured earlier and produced 5 bushels more per acre on the same amount of water as unfertilized wheat.

A COMPLETE LINE OF Nitrogen Products

Here is the most complete line of nitrogen products available to the fertilizer industry, made by America's leading producer of nitrogen and backed by many years of experience, dependable service and expert technical assistance:

Arcadian®

NITROGEN SOLUTIONS:

URANA®
NITRANA®
U-A-S*
N-dure*

Other Nitrogen Products:

Anhydrous Ammonia
Urea Products
A-N-L®
Ammonium Nitrate
Sulphate of Ammonia
American Nitrate of Soda

NITROGEN DIVISION ALLIED CHEMICAL

NITROGEN DIVISION
Allied Chemical & Dye Corporation
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Hopewell, Va.	Indianapolis 20, Ind.
Ironton, Ohio	Columbia 1, S. C.
Omaha 7, Neb.	Raleigh, N. C.
Columbia, Mo.	Atlanta 3, Ga.
Kalamazoo, Mich.	Los Angeles 5, Cal.
St. Paul 4, Minn.	San Francisco 4, Cal.

*Trade-mark

INDUSTRY News

Naugatuck Shifts Sales Execs.

T. W. Brasfield, formerly sales manager of agricultural chemicals for the Naugatuck Chemicals Division of

T. Brasfield

O. P. Steinen

U. S. Rubber Co., has just been transferred from Connecticut headquarters to the west coast where he will be district manager of the Los Angeles office for the division. He succeeds G. L. Dennis, who has been transferred back to Naugatuck for a new assignment on the general sales staff.

The new agricultural chemicals sales manager at Naugatuck is Otto P. Steinen, who was formerly assistant sales manager.

•

Reed Heading Soils Program

J. Fielding Reed, southern manager of the American Potash Institute, is this year's program arranger for the Crops and Soils Division of the Association of Southern Agricultural Workers' meeting in Birmingham, Ala., Feb. 4, 5, and 6., at the Dinkler - Tutwiler Hotel. Among the speakers scheduled were: D. D. Mason, N. C. State College, Raleigh, who discussed "The Evaluation of Fertilizer Responses from the Standpoint of Costs and Returns"; R. Maples and R. L. Beacher, University of Arkansas, Fayetteville, spoke on "Comparison of Soil Tests and Fertilizer Response with Cotton"; and Frank Boyd, Virginia-Carolina Chemical Corp., Montgomery, Ala., discussing "Fertilizing According to Soil Test."

•

Raufer Resigns Michigan Post

Alfred C. Raufer, director of sales of the Michigan Chemical Corporation for the past five years, has resigned, effective February 1. Mr. Raufer will make his home at 1418 North Hibiscus Drive, Clearwater, Fla.

•

Pennsalt Names Bixby

Pennsalt Chemicals, Philadelphia, has named Arthur F. Bixby to manager of marketing research in its Industrial Division. He will supervise product managers and direct market development of the company's heavy chemicals and "Sharples" brand specialties.

Prior to his new appointment, Mr. Bixby was general manager of agricultural chemicals for Pennsalt's Western Division at the company's Tacoma, Washington, headquarters. He joined Pennsalt in 1938 as assistant to the director of heavy chemical sales.

•

Sales Mgr. for Retzloff

Retzloff Chemical Co. has named Latane Lamb as general sales manager, in charge of agricultural chemical sales. He was formerly with Atlas Powder Co.

•

Seeland Named Penick VP

Frank Seeland

S. B. Penick & Co., New York, suppliers of insecticide raw materials have announced the election of Frank Seeland as vice president. With the company since 1952, Mr. Seeland was appointed manager of the Agricultural Chemicals & Insecticide Division in 1955. Under his leadership, the division expanded its operations to introduce such products as Sulfoxide, Ryania, Warfarin and Pro-Noxfish R.

•

Diamond Appoints Gerdes

Diamond Black Leaf Co., Cleveland, has appointed Emil C. Gerdes to the position of manager of commercial products. Mr. Gerdes replaces Dr. James M. Merritt, who has resigned. A native of Des Moines, Iowa, Mr. Gerdes has been midwestern manager of Diamond Black Leaf since Dec., 1955.

Need for Technical Manpower to be Stressed at NAC's Meeting

THE need for more technically trained men and women to speed progress in agriculture will be highlighted at the spring meeting of the National Agricultural Chemicals Association in San Francisco, March 6, 7 and 8, 1957. The meeting will be held in the Fairmont Hotel.

The program will bring into sharp focus the growing opportunities in all technical phases of agriculture, including the agricultural chemicals industry, and the need for encouraging young men and women to train for openings in industry and in government agencies allied to agriculture.

The program also will probe into the economics of agriculture, with discussions by top leaders on the importance of financing and credit to agricultural progress, and on the outlook for return on investment in the agricultural chemicals industry.

Where growers and industry stand under the Miller Amendment to the Food, Drug and Cosmetic Act will be discussed by representatives of government agencies.

Specific topics on the program are:

Wednesday, March 6 — President's address on the outlook for the agricultural chemicals industry, Fred W. Hatch, NAC president and manager, Agricultural Chemical Division.

African Pyrethrum

It's a fact Insects are not resistant to Pyrethrum

PYRETHRUM (P.Y.R.), harmless to human and animal life, is

Unsurpassed in Quick Knock-Down

Economy in Concentration With Synergists

Rapid Dispersal High Penetration

PYRETHRUM (P.Y.R.) offers highest protection for


Tobacco Storage


Home Aerosols and Sprays


Poultry Houses


Food-Meat Packers


Ship's Holds


Granaries and Flour Mills

Always insist upon Pyrethrum (P.Y.R.) Base Insecticides

"Have you seen Pyrethrum Facts for 1957?"

TO: AFRICAN PYRETHRUM DEVELOPMENT, INC. 3
65 Pine Street, New York 5, N.Y.

Please send me__copies of free booklet, Pyrethrum Facts.

NAME__________

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CITY__________ STATE__________

P·Y·R
AFRICAN PYRETHRUM

Shell Chemical Corp.; "Men for Agricultural Progress," Dr. S. B. Freeborn, provost, University of California, Davis, Calif.; "Money for Agricultural Progress," Earl Coke, vice president, Bank of America, and former Assistant Secretary of Agriculture; and "Credit for Agricultural Progress," J. A. Walker, general credit manager, Standard Oil Company of California.

Thursday, March 7—will be devoted to Association committee meetings and conferences.

Friday, March 8 — Fred Shanaman, president, Pennsylvania Salt Manufacturing Company of Washington, speaking on the outlook for return on investment in the agricultural chemicals industry; discussion by representatives of government agencies on where growers and industry stand today under the Miller Amendment; a report on the latest developments in forest pest control; and a graphic presentation of the current work of the NAC Association.

•

TVA Nitrogen Shipments Cut

The Tennessee Valley Authority cut back its distribution of phosphate and nitrogen fertilizer sharply during fiscal 1956, according to the agency's annual report.

The drop was in accordance with policy changes on TVA production and shipments as private industry demonstrated its ability and willingness to meet the demand created by test demonstration projects of the agency. The report also said that production of concentrated superphosphate was less than half trat of 1955.

As against shipments of around 380,000 tons of fertilizers in fiscal 1955, last year's shipments fell to about 263,000 tons, most of which was for selected uses in thirty-five states.

•

English Retires From Baker Bro.

H. J. Baker & Bro., New York, announced the retirement of William H. English, Jr., as a partner as of December 31, 1956. The firm, one of the oldest in the fertilizer and feed field, will continue under the same trade style.

CFA Slates April Meeting

The California Fertilizer Association has announced plans to hold their fifth annual conference on the campus of Fresno State College, Fresno, Calif., on April 14 and 15. A program is being developed to interest fertilizer concerns, dealers, and salesmen, as well as farmers and research workers of the universities and the USDA.

•

Fisons Contract to C. & I.

Fisons Limited, manufacturers of fertilizer and chemicals, announce the award of a contract to Chemical and Industrial International, Ltd., of Nassau, Bahamas, for the construction of a 250 ton per day nitric acid plant to be built at their facilities at Stanford-le-Hope on the Thames estuary.

This plant was designed by the Chemical and Industrial Corp., Cincinnati, and will be constructed by Chemical and Industrial International, Ltd., who have the right to license C&I processes outside of the United States and Canada.

This is a single unit high pressure nitric acid plant and is the second plant of this type furnished recently in Europe where for many years the atmospheric type nitric acid plant has been used.

•

Fertilizer, Seed Meetings

County agents and bankers in seven Georgia towns have teamed to sponsor a series of seed and fertilizer meetings during January and February. The theme at the meetings is "More Profits from Using Better Seed and Efficient Fertilization." Meetings will last through the middle of February.

•

New Celite Sales Manager

C. A. Cocks has been appointed New York district sales manager for the Celite Division of Johns-Manville Corp., New York. Mr. Cocks is responsible for sales in New England, New York, New Jersey, Maryland, Virginia, District of Columbia, and part of Pennsylvania.

A resident of Convent Station, N.J., Mr. Cocks has been with Johns-Manville since 1939.

Heads McMahon Bros., Inc.

Paul J. McMahon was named president of McMahon Brothers, Inc., Binghamton, N. Y., at a recent meeting of the board of directors in Binghamton. Mr. McMahon was formerly sales manager of the Ithaca Division of the New York State Electric and Gas Corp.

McMahon Brothers is a weed and brush control firm which provides spraying service, manufactures spray units for roadside spraying, and distributes agricultural chemicals, power sprayers, and spray pumps. The company is active in the Northeast.

•

Chase Appoints Mohler

Arthur M. Mohler has been appointed manager of the fertilizer division of Chase and Co., Sanford, Fla. Mr. Mohler is a former vice-president of Lebanon Chemical Co., Lebanon, Pa.

•

New Glorion Sales Policies

The Glorion Division of Aluminum & Chemical Corp., Greenwich, Conn., a manufacturer of soil conditioners and fertilizers, has discontinued the services of an "inside" sales force in favor of manufacturer representatives in various areas.

Three such representatives have been appointed so far. Feinman & Gottlieb, New York, will handle sales in the metropolitan New York area; Victor Baird of Feinman & Gottlieb, Silver Spring, Md., will cover the Eastern Pennsylvania area; and Kelly-Stewart & Co., Cambridge, Mass., will cover New England.

•

Pacific Agro Co. Operating

The newly formed Pacific Agro Co. has begun business in Seattle, Wash., with a line of products for Pacific Northwest farmers and gardeners. The company is specializing in trace element fertilizers and home garden plant foods.

President of the new concern is R. W. Cool of Tonasket, Wash., where he heads Agro Minerals, Inc., manufacturers of gypsum and epsom salts. Robert H. Allard is vice president and general manager, and Lee Fryer is vice president and manager of the plant food division.

Officers for 1957 of the Mississippi Entomological Association: E. Brodaus of Jackson, president; Dr. M. E. Merkl of Stoneville, vice president, and A. G. Bennett of State College, secretary and treasurer.

The distinguished service award of the Mississippi Entomological Association was presented to Professor R. W. Harned of Washington, D. C., left, by Dr. Clay Lyle, dean and director, Mississippi State College.

. . . Highlights of Mississippi Control Conference

AN announcement of the cotton insect control recommendations and warnings on the dangers of phosphate insecticides highlighted the third annual Mississippi Insect Control Conference at Mississippi State College, January 10-11.

A much greater use of phosphates in boll weevil control was predicted in case heavy infectations build up in the 1957 crops. While these materials were recommended, it was emphasized that phosphates are just as effective in controlling man as they are in controlling insects.

A recommendation of the conference called for all insecticide labels to contain not only suggested uses of a material, but also a "do not use for . . . " warning. All precautions should be specified on labels.

Insecticides recommended for boll weevil control in Mississippi for 1957 include aldrin, BHC, calcium arsenate, dieldrin, endrin, toxaphene, heptachlor, malathion, guthion and methyl parathion. All except calcium arsenate are also recommended as spray materials.

Dr. M. E. Merkl, USDA entomologist at the Stoneville Branch Experiment Station, stated that guthion gave the most outstanding results in boll weevil control during 1956 of any other insecticide. "Applied at one-fourth to one-half pound per acre, it gave excellent results in all locations," he said.

Dr. John Johnston of the National Cotton Council at Memphis, Tenn. agreed that boll weevils have become resistant to some insecticides. He pointed out that the chemical industry cannot continue to produce new chemicals as fast as boll weevils become resistant. A control program must be deloped that is not dependent on chemicals alone. He named early stalk destruction as the most important single item in such a program.

In reporting highlights of cotton insect control research at the Stoneville Branch Station, Dr. Merkl indicated that Thimet and Bayer 19369 used as a systemic seed treatment lowered germination of seed, gave excellent control of thrips, made for faster early growth of the cotton plant, but retarded fruiting. He concluded that possibly reduced stands and retarded fruiting may offset any benefits from early growth and thrips control.

A. L. Hamner, entomologist at Mississippi State College, pointed out that poisoning to protect blooms after the first four or five weeks of blooming may not be profitable.

Early season boll weevil control is especially important, he said. Around 89 per cent of the crop is set from blooms in the first five weeks or less of blooming. He did indicate that poisoning should be continued to protect bolls set from these early blooms.

A panel of commercial pest control operators indicated that resistance of roaches, especially, to the chlorinated hydrocarbons is a major problem with them. Where chlordane and DDT formerly gave almost absolute control, they no longer have any effect on some strains.

Officers of the Mississippi Entomological Society, elected during the annual meeting are E. Broadus of Niagara Chemical Division, Jackson, president; Dr. Merkl, vice president, and A. G. Bennett, leader Extension entomology, State College, secretaary and treasurer.

Directors are Gene Merrill, General Chemical Company, Greenville; C. A. Wilson, Mississippi State College; W. R. Smith, Shell Chemical, New Orleans; and David Young, extension entomologist, immediate past president.

Panel participants during the two-day meeting included: R. E. Duggan, chief chemist, Food and Drug Administration, New Orleans; Dr. John Johnston; Dr. Randle Furr, entomologist at the Stoneville Station; Mr. Mamner, O. T. Guice of the State Plant Board, Dr. Merkl; James Lanier of Chemagro, Thibodaux, La., Mr. Broadus.

Mabry Anderson of Clarksdale, L. T. Wade of Rolling Fork, Vic Sutter of Greenwood and Lee Abide of Greenville, all representing Aerial Applicator's Association; USDA entomologists C. C. Fancher, C. D. Gaddis, Hiram Young, T. D. Persons, H. R. Johnston, J. Cowger all of Gulfport; Dr. S. E. Jones of Brownsville, Texas, J. W. Ingram of State College; R. C. Morris of Stoneville; and representing the U. S. Public Health Service, John Kilpatrick of Savannah, Ga.; pest control operators J. C. Reed, Charles Treadway and A. H. Jackson all of Jackson, and Paul Adams of Alexandria, Louisiana.


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INGELHEIM AM RHEIN
GERMANY.

CCC Appoints Rosenbloom

William J. Rosenbloom has been appointed director of Engineering for the Chemical Construction Corp., New York, a subsidiary of Electric Bond and Share Co. He developed the electrolytic hydrogen cell and the atmospheric ammonium sulphate process used in many of the powdered materials.

•

Spencer Names Haldeman

Ned P. Haldeman has been appointed by the Spencer Chemical Co., Kansas City, as agricultural chemicals sales representative in Mississippi and Louisiana, replacing Tom Campbell.

•

Naugatuck Expands Facilities

The Naugatuck Chemicals Division of U. S. Rubber Co. has just announced the enlargement of its laboratory facilities at the experimental farm and greenhouse which the Division maintains at Bethany, Conn. The expansion program doubles previous laboratory facilities.

•

UCC Appoints L. W. Newton

L. W. Newton has been appointed assistant to the vice president of research of Carbide and Carbon Chemicals Co., a division of Union Carbide and Carbon Corp., New York.

Dr. Newton has been engaged principally in administrative duties at Carbide's research center in South Charleston until his current promotion. He is a native of Newton, Kans., and received his Ph.D. degree in Chemistry from Harvard University in 1941.

•

New D-O Baltimore Office

Dorr-Oliver Inc., Stamford, Conn., has announced the opening of a new office in Baltimore, Md., at 2125 Maryland Ave. The new office is expected to enable Dorr-Oliver to provide better service to engineers and industry in the mid-Atlantic states of Virginia, West Virginia, Maryland, and Delaware.

Sales engineers Kelsey C. Lindstrom and Benjamin F. Rockecharlie have been transferred to the new office from division headquarters in Stamford.

Discussions on Herbicides, Fungicides Highlights 1957 N. C. Pesticide School

THE 1957 Pesticide School at North Carolina State College opened Jan. 10 with more than 200 chemical dealers, formulators, manufacturers, and county agents, farm superintendents, and vocational agricultural teachers enrolled.

D. S. Weaver, director of the college's Agricultural Extension Service, opened the two-day school which was devoted to reviewing the latest research data and recommendations.

H. R. Garries, in charge of plant pathology extension, served as program chairman, and J. C. Wells, plant pathology extension, G. C. Klingman, and W. M. Kulash, presided over the instructional sessions.

Guest speaker Dr. George M. McNew, Boyce Thompson Institute of Plant Research, Inc. of Yonkers, N. Y., reviewed the search for the perfect fungicide, while Dr. James B. DeWitt, U. S. Fish and Wildlife Service, Patuxent Research Reserve, Laurel, Md., discussed new developments in repellents and rodenticides.

Among the topics of discussion during the opening morning's session were fungicidal control of fruit disease, C. N. Clayton; some problems with cottonseed treatment, H. R. Garriss; soil treatments for disease control in plant beds, C. J. Nusbaum and N. N. Winstead; disease control in floral crops, Robert Aycock; and control of Southern stem rot, J. C. Wells, all of the college's Plant Pathology Department.

Herbicides were on the agenda for the afternoon meeting. Orvin E. Rud dealt with the herbicide situation in peanuts, cotton, and soybeans; Glenn C. Klingman, with small grain and corn; and W. G. Westmoreland covered herbicides around the home and new approaches to field problems.

George D. Jones reviewed major changes in control recommendations. These changes as well as recommended dosages and reports on recent research are all included in the 1957 Pesticide Manual which was compiled by the college for those attending the course. The 130-page booklets are available through the College Extension Division, Box 5125, State College Station, Raleigh, N. C. Single copies are $1 each and four or more are 75 cents apiece.

A report on cooperative insect surveys was given by M. H. Farrier, Entomology Department. A new addition to the Pesticide School, Farrier explained the functions of the survey—to gather data, identify insects, to conduct periodic checks, and to forward the State's latest findings to Washington, D. C. for publication.

Program chairman R. Garriss (center), chats informally with G. M. McNew, Boyce Thompson Institute, left and Dr. James B. DeWitt, U. S. Fish and Wildlife Service.

Instructors and students at the Pesticide School; John Glover, Clyde Smith, and W. G. Westmoreland, all of State College; and Harold H. Nau of Raleigh.

Cotton States Branch, E.S.A., to Meet in Birmingham, Feb. 4-6

THE thirty-first annual meeting of the Cotton States Branch, Entomological Society of America, will be held at the Dinkler-Tutwiler Hotel in Birmingham, Alabama, on

Dr. A. W. Tissot
Chairman of the Cotton States Branch, E.S.A.

February 4, 5 and 6, according to Dr. A. W. Tissot, Branch Chairman. The meeting this year will be held in connection with the Association of Southern Agricultural Workers.

A most interesting program for the meeting has been planned, according to L. C. Murphree of Starkville, Miss., who is program chairman. The first day of the meeting will include an address by Dr. H. M. Armitage of Sacramento, California, who is president of the Entomological Society of America. Dr. Tissot will deliver the address of the Branch Chairman. An important item of business will be the report on the constitution and by-laws for the Cotton States Branch. A committee headed by Dr. J. H. Cochran of Clemson College has presented a proposed constitution to the membership for ballot. His report will be of interest to the entire membership. Other features of the first day of the meeting will be a report by Dr. V. M. Kirk of Florence, South Carolina, on the Tenth International Congress of Entomology which was held last summer in Montreal, Canada, and a series of papers on the control of houseflies, hornflies, chiggers, and insects of peanuts and vegetables. Mr. O. I. Snapp, U.S.D.A., Fort Valley, Georgia, will report on experiments on the control of plum curculio on peaches with soil treatments. Reports on the cyst nematode and the burrowing nematode will also be presented.

A symposium on recent insect invaders, led by Dr. J. T. Creighton, is an important feature of the program on February 5. The symposium will feature the status of the European corn borer, pepper maggot, white-fringed beetle, and the Mediterranean fruit fly in the South. Tuesday morning will also feature an invitational address by Mr. Frank Holland, manager of the Florida Agricultural Research Institute.

The program Tuesday afternoon will begin with an invitational paper by Dr. J. S. Roussel of Louisiana Agricultural Experiment Station on boll weevil resistance to chlorinated hydrocarbon insecticides. Following this address the entomologists will split into two sections, one for a discussion on cotton insects and another on corn insects. A hospitality hour and banquet will be given Tuesday evening.

The film, "The Rival World," will be shown to the assembled entomologists on Wednesday morning after which the meeting will split into two sections for research reports. One section will deal with researches on mosquitoes, tobacco insects, and pests of ornamentals and forests. A report on a study by the National Research Council of protection against decay and termites in residential construction will be given by Mr. R. J. Kowal of the U.S.D.A. Forest Service at Asheville, North Carolina. The other section will feature reports on cotton insects. A very important discussion will be given by Gordon Barnes of Fayetteville, Arkansas, on the influence of education of growers on boll weevil control.

The program committee for the thirty-first meeting of the Cotton States Branch is composed of Hamilton Laudani, Vernon Kirk, Eldon Scott, J. E. Zeigler, J. W. Wilson, and L. C. Murphree, chairman. G. R. Williamson of Montgomery, Alabama, is in charge of local arrangements and is assisted by Norman Downey of Birmingham and J. E. Zeigler of Millbrook, Alabama.

Copies of the published program are available from W. G. Eden, Auburn, Alabama.

•

Sterling Buys d-Con

Sterling Drug, Inc., New York, has bought d-Con Co., Chicago, a manufacturer of rodenticides. The transaction involves d-Con's inventory of finished products.

The Chicago firm has been dissolved and reorganized by Sterling under the same name. Frank A. Corbet, vice president of Sterling's National Brands Division, has been elected president of the d-Con Co.

•

Expand Georgia Paper Plant

Directors of the Union Bag-Camp Paper Corp., New York, recently approved a multi-million dollar expansion and modernization program for the company's Savannah, Ga., plant.

Plans include the installation of a new paper machine and complete equipment for a new hardwood pulp mill. Scheduled for completion within three to four years, the new paper machine will be the seventh operated by Union Bag at Savannah. It will produce principally light weight kraft papers.

•

N. E. Chemical Co.'s Merge

Four New England chemical and fertilizer firms have merged to form the Hubbard-Hall Chemical Co., Waterbury, Conn. The merger gives the new company four fertilizer factories located in the heaviest consuming areas of Southern new England.

Companies involved are Apothecaries Hall Co., Waterbury, the Rogers & Hubbard Co. of Portland, Conn., the Woodruff Fertilizer & Chemical Works, Inc., North Haven, Conn., and the Old Deerfield Fertilizer Co., South Deerfield, Mass. The new company's plants are located at North Haven, Portland, and East Windsor, Conn., and South Deerfield, Mass. Warehouses will be maintained at other points.

Frederick R. Kellog was elected president of the new firm and Edward R. Jones was named executive vice president and treasurer.

Alabama Pest Conference

The tenth Alabama Pest Control Conference to be held in Auburn, Ala., February 19-20, will feature a talk by J. E. Burger, Cornell Seed Co., on "How to Get Better," in relation to promoting and selling pesticides, pest control service, and products requiring control. Other outstanding speakers will be: R. C. Gaines, USDA, "Resistance of boll weevils to insecticides." C. C. Fancher, USDA, "Mediterranean fruit fly." T. W. Reed, California Spray-Chem. Corp., "Compatibility of liquid fertilizers with pesticides." J. W. Kilpatrick, US Public Health Service, "Control of resistant flies and roaches." M. I. Anderson, "Reducing hazards in phosphate application."

•

Monsanto Sues Co-op

Monsanto Chemical Co., St. Louis, has filed suit in the Federal District Court in Salt Lake City to enjoin Central Farmers Fertilizer Co., Chicago, from using knowledge and information that a CFFC employee allegedly acquired while he was with Monsanto. The co-op is mining phosphate rock in southeastern Idaho and plans to build an electric furnace to convert ore into high-analysis fertilizer materials.

•

Garden Show in N. Y., Feb. 17

Eastern dealers and wholesalers will be attending the 16th National Garden Supply Show, Feb. 17-19 at the Coliseum in New York City. New products to be featured at the exhibit will include a selective crabgrass killer, seed packager, and a power driven spreader.

•

Hatch To Address Canners

Fred Hatch, president of the National Agricultural Chemicals Association, and Earl Butz, Assistant Secretary of Agriculture, will address the 50th Convention of the National Canners Assn., in Chicago, Feb. 16 to 19. Mr. F. Hatch and Mr. E. Butz will present a discussion of the findings of agricultural research and of agricultural programs of the past and will stress what trends and desirable courses these indicate for the future.

Geigy Appoints Sparks

Geigy Agricultural Chemicals, Division of Geigy Chemical Corp., Ardsley, N. Y., has appointed David H. Sparks as southeastern technical field representative. While attending college he was employed by Geigy as a technical field assistant during the summer field seasons of 1953 and 1954. Prior to joining the Geigy organization this year he was employed by the Olin Mathieson Chemical Company. Mr. Sparks will make his headquarters at Leland, Mississippi.

•

Indiana Pest Control Conf.

The 21st annual Indiana Pest Control Operators' Conference, held at Purdue University, Lafayette, Ind., from Jan. 28 to Feb. 1, was highlighted by six sessions on the 1956 Pest of the Year, the cockroach.

Also discussed were the Miller Bill and Food and Drug Laws, and their relationship to the pest control operator as well as the pest control operators' duties in Civil Defense. A demonstration session on new techniques in applying pesticides was held along with a discussion of business equipment for office management.

•

Snell Buys Seil, Putt & Rusby

Foster D. Snell, Inc., New York, consulting chemists and chemical engineers, has purchased Seil, Putt and Rusby, Inc., New York, a chemical consulting firm.

Dr. Stephen S. Voris, president of Seil, Putt and Rusby, has joined the parent organization as director of the new subsidiary. This is the fourth major expansion in recent years for Foster D. Snell, which has branch offices in Bainbridge, N. Y., Baltimore, Md., and Beverly Hills, Calif.

•

E. African Pesticide Plant

Murphy Chemicals (East Africa), Ltd., a company owned jointly by A. Bauman and Co., Ltd., and the Murphy Chemical Co., Ltd., both of England, and producing many types of agricultural and horticultural insecticides, was established recently at Kahawa Station, near Nairobi, East Africa.

The company is marketing insecticides in special packages within the cost range of African farmers and labelled with instructions in Swahili as well as English. The packages are cotton and polyethylene bags which can be put to a variety of uses when empty.

•

USDA Pest Control Progress

The U. S. Department of Agriculture has reported that encouraging gains were made during 1956 in plant pest control. The department also reported that there is evidence that some dangerous plant pests can be eradicated, rather than only temporarily controlled.

At the beginning of 1957, workers were well along with the eradication of such costly pests as the Mediterranean fruit fly, Khapra beetle and Hall scale. A good start has been made in the direction of ultimate eradication of the gypsy moth.

Witchweed, which attacks the roots of corn plants, has been found in the Carolinas and control work for the parasite plant is being planned for the coming season.

•

Cotton Council Meets

The nineteenth annual meeting of the National Cotton Council of America was held at the Sheraton-Jefferson Hotel, St. Louis, Mo., on Jan. 28 and 29. The delegates were welcomed to St. Louis by Mayor Raymond R. Tucker. Col. Francis J. Beatty, president of the group, delivered the annual president's address, and reports on program activities during 1956 were heard as well as recommendations for 1957 activities.

•

CFA Fertilizer Workshops

The Soil Improvement Committee of the California Fertilizer Association, San Marino, Calif., is sponsoring a series of workshops for Riverside, Fresno, Salinas, and Sacramento. The committee has designated two of its members to act as discussion leaders at each of the workshops. The discussions will be based on the text of the Western Fertilizer Handbook.

International Meet Planned

The National Academy of Sciences — National Research Council has approved the holding in October, 1957, of an international conference on the fundamental processes of plant metabolism as related to the systemic action of pest control chemicals, which include antibiotics, insecticides, and weed control chemicals.

The conference will be patterned after the conference on the use of antibiotics in agriculture held under similar auspices in October, 1955. Further information may be obtained from the NAS-NRC Division of Biology and Agriculture, 2101 Constitution Ave., Wash. 25, D. C.

•

Ethylene Diamine Cost Cut

A price reduction of four cents a pound for ethylene diamine has been announced by Carbide and Carbon Chemicals Co., a Division of Union Carbide and Carbon Corp., New York. This brings the tank car price down to forty cents a pound.

Fungicides for the control of apple scab and cherry leaf spot are made from ethylene diamine and stearic acid. Other useful fungicides, such as ethylene dithiocarbamate salts, also require ethylene diamine and carbon disulfide.

•

Chase Expands Dixie Staff

Chase Bag Co., Chicago, recently expanded the managerial staff of its Southern sales region and New Orleans manufacturing plant.

J. H. Counce, Southern Regional Sales Director, who has also functioned as manager of the New Orleans branch, will devote all of his time to direction of sales in the Southern region. D. H. Denholm, formerly chief industrial engineer for Chase, has been appointed manager.

•

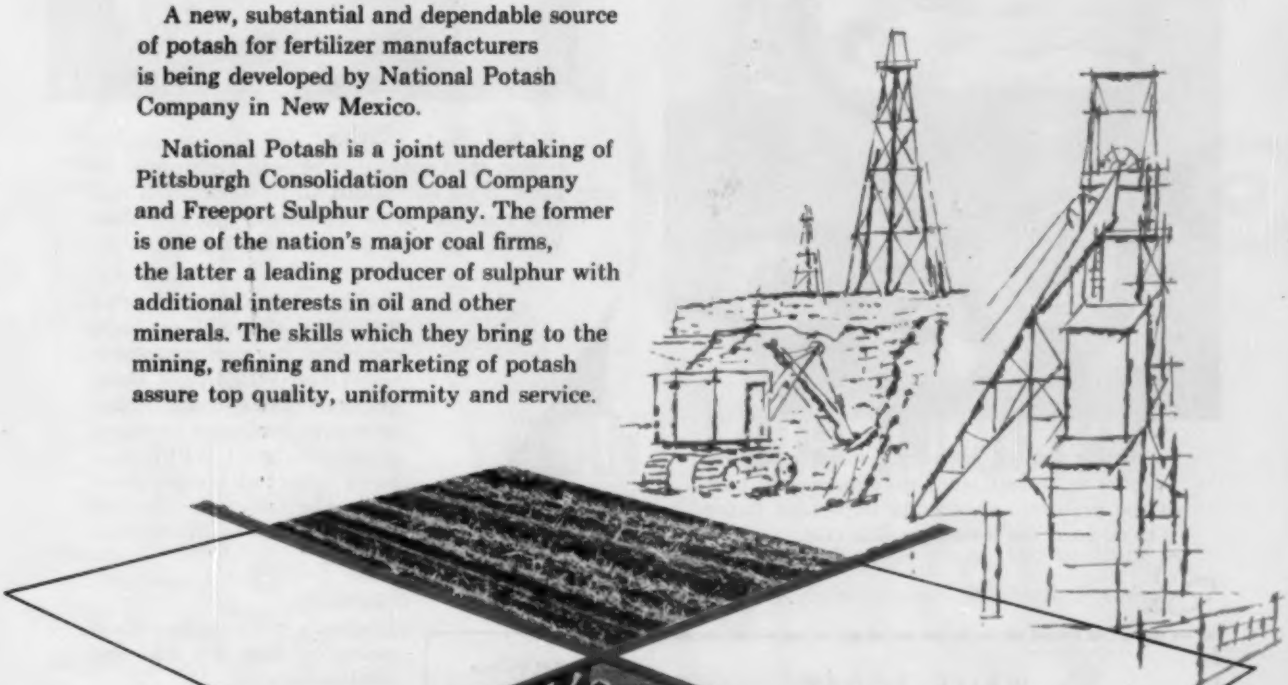
Southern States Promotes 2

The Southern States Phosphate & Fertilizer Co., Savannah, Ga., has promoted two young officials to vice president. Jack Dana Lee has been promoted to vice president in charge of manufacturing and Charles B. Compton is vice president in charge of sales.

a joint venture in Potash

A new, substantial and dependable source of potash for fertilizer manufacturers is being developed by National Potash Company in New Mexico.

National Potash is a joint undertaking of Pittsburgh Consolidation Coal Company and Freeport Sulphur Company. The former is one of the nation's major coal firms, the latter a leading producer of sulphur with additional interests in oil and other minerals. The skills which they bring to the mining, refining and marketing of potash assure top quality, uniformity and service.



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By: T. R. Moorer, Branch Manager, Bag Division, Fulton Bag & Cotton Mills, Atlanta, Georgia

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Velsicol To Offer Parathion

Velsicol Chemical Corp., Chicago, announced it will have technical methyl parathion available for the coming growing season. According to J. F. Kirk, vice-president in charge of sales, research results reported last month at the National Cotton Production Conference at Birmingham indicated that methyl parathion will be used widely during 1957 to control boll weevils in areas where resistance has developed to BHC and other chlorinated hydrocarbon insecticides. Methyl parathion is also said to be particularly effective in controlling mites and aphids on cotton and other crops.

Velsicol, producers of chlorinated insecticides, manufactures technical endrin, heptachlor and chlordane at plants located in Memphis, Tennessee, and Marshall, Illinois.

•

Southern APS In Birmingham

Members of the southern division of the American Phytopathological Society met at the Bankhead Hotel in Birmingham, Ala., on Feb. 4 and 5. The afternoon meeting of Feb. 5 was a joint session with the southern region of the American Society for Horticultural Science and took place in the Dinkler-Tutwiler Hotel ballroom.

J. A. Lyle, head of the Department of Botany and Plant Pathology, Alabama Polytechnic Institute, Auburn, presided over the convention. Presiding over the three sections of the meeting were: E. P. Ducharme, Florida Agricultural Experiment Station, Lake Alfred; L. I. Miller, Virginia Agricultural Experiment Station, Holland, Va.; and G. M. Watkins, Head, Department of Plant Physiology and Pathology, Texas Agricultural Experiment Station, College Station, Tex.

•

Davison Transfers Onstot

Perry O. Onstot has been appointed agronomist and sales promotion manager for the Mixed Fertilizer Division of Davison Chemical Co., Division of W. R. Grace & Co., Baltimore, and transferred from the branch office at Joplin, Mo., to the Baltimore headquarters.

Totman Heads Maine House

James C. Totman, vice president of Northern Chemical Industries, Inc., Baltimore, and manager of Summer Fertilizer Co.'s Bangor, Me., office, was elected majority floor leader of the Maine House of Representatives at the start of the legislature's 98th session. Mr. Totman is in his fourth term as State Representative from the city of Bangor.

•

Diamond Expands Iowa Plant

The Diamond Black Leaf Co., Cleveland, has started a major modernization and improvement program at the company's agricultural chemicals plant in Des Moines, Iowa. The project, which calls for construction of a concrete building and eight storage tanks, as well as installation of new and improved equipment, is expected to be completed this month. The Des Moines plant, acquired by Diamond in November, 1955, produces weed killers and brush control chemicals.

•

Test Fungicide Vapors

Experiments at the Connecticut Agricultural Station, New Haven, have shown that vapors of some fungicides effective against soil-inhabiting fungi are highly toxic to specific species of Rhizoctonia, Botrytis, Fusarium, and Thielaviaopsis.

In the Connecticut tests, fungicides were kept from direct contact with the fungi. Only those materials which had vapors found toxic to rhizoctonia solani in the laboratory were also toxic to it in soil and prevented its killing of zinnia seedlings.

•

Film Features Apple Mildew

The department of plant pathology of Cornell University, in cooperation with Rohm & Haas Co., Philadelphia, has produced an educational 16 mm sound motion picture which features powdery mildew of apples. The film is expected to be of particular interest not only to fruit growers but also to pesticide dealers, gardeners, county agents, vocational agricultural teachers, and students. Prints of the 15-minute, color film may be obtained on loan without charge from any Rohm & Haas office.

•

New Crag Designation

Carbide and Carbon Chemicals Co., a Division of Union Carbide and Carbon Corp., New York, has re-designated Crag Herbicide-1, a weed preventer that kills sprouting weed seeds. The new name for the product, Crag Sesone, was adopted to assist experiment station personnel and growers in the identification of pesticides.

O. M. Scott Elects Mills

O. M. Scott and Sons, New York, has elected C. B. Mills chairman of the board of directors. In a concurrent action, P. C. Williams was elected president and treasurer. Mr. Mills had been president and Mr. Williams vice president and treasurer since 1948.

The company is currently involved in a $2,500,000 expansion program for their grass seed and garden chemicals facilities in Marysville, Ohio.

NPFI Cites Farm Editors

Frederic B. Knoop (right), executive editor of The Farm Quarterly, Cincinnati, and Ralph Sandlin Yohe (center), associate editor of The Prairie Farmer, Chicago, were honored as two of the nation's outstanding agricultural writers, who most effectively carried the message of soil building to their farm magazine readers in 1955. They were winners in the National Plant Food Institute's "Soil Builder's Award for Editors" contest and received plaques, presented by Louis H. Wilson (left), the institute's secretary and director of information, at the winter meeting of the American Agricultural Editor's Assn. held recently in Chicago. Mr. Yohe was winner among the farm magazines with more than 300,000 circulation and Knoop was winner among the magazines with less than 300,000 circulation.

•

New Plant Pest Handbook

The Connecticut Agricultural Experiment Station, New Haven, has published a 200-page Plant Pest Handbook for those who are interested in plants for pleasure and profit. The handbook brings together basic information on pests and related injuries that occur on flowers, fruits ground covers, shrubs, tobacco, meadows, small grains, and vegetables.

The handbook is being offered for $1 and may be obtained directly from the station.

•

Cyanamid Expansion Noted

In an address to the Society of Security Analysts in San Francisco late in 1956, K. C. Towe, president of the American Cyanamid Co., New York, touched on some of the company's projected plans for 1957.

Mr. Towe reported that the company's new plant at Brewster, Fla., is expected to start operations in the summer of 1957 with a capacity for producing 200,000 tons of triple superphosphate per year. Mr. Towe also reported that two new chemical compounds for agricultural use will be available in commercial quantities in 1957. The new systemic insecticide, Thimet, affords protection to plants against insects during the early stages of growth, and amino-triazole is a dual-action chemical for cotton defoliation and re-growth control. Amino-triazole has proved effective also against Canada thistle, the worst weed pest of the Central States.

•

Soil Builders Contest Open

Farm magazine editors of the nation have been invited to submit entries for the fifth annual National Plant Food Institute's "Soil Builders Award for Editors" contest, the deadline for which is March 15, 1957. The contest is designed to honor editors and their staffs for their 1956 editorial contributions in the field of building and maintaining soil fertility.

•

Japan Plans Ammonia Output

A leading Japanese chemical company, Asahi Chemical Industry Co., Ltd., is reported to have plans well advanced for construction of a new ammonia plant at Noboeka, Miyazaki-ken on Kyusha Island, Japan.

Chemical Construction Corp., New York, is designing the plant, which will have a capacity of 50 metric tons a day and will utilize the Texaco oil gasification process. Ammonia from the new plant will be used to manufacture ammonia fertilizers, plastics, rayon, explosives, and other products.

Pyrethrum Shipments Up

In the 1956 crop year African pyrethrum producers exported 13 million lbs. of pyrethrum flowers (or the equivalent in extracted pyrethrins) reported *Pyrethrum Facts for* 1957, a booklet just issued by African Pyrethrum Development Inc., New York. This was equivalent to 150,000 pounds of pure pyrethrins. The booklet, which lists a number of general facts about the insecticide, predicts a doubling of the 1956 production by 1960.

•

Aceto Adds Fungicides

The Aceto Chemical Co., Inc., Flushing, N. Y., announced recently the addition of agricultural fungicides to their product line.

Included among the new products are: thiram (tetramethyl thiuram disulfide), zineb (zinc ethylene bis dithiocarbamate); ziram (zinc dimethyldithiocarbamate), and MCPA (meta chlorophenoxy acetic acid).

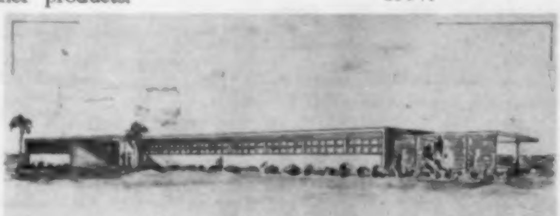
All products consist of 100 per cent active powder.

•

U.S. Borax Profits Up

An increase in profits of more than 13 per cent for the fiscal year ended Sept. 30, 1956, was reported by United States Borax & Chemical Corp., Los Angeles. The company, which was formed in July, 1956, by the merger of U.S. Potash Co. and Pacific Coast Borax Co. of Nevada, reported that the record high profits were the result of a 12 per cent increase in sales.

The 1956 sales were compared with the combined 1955 sales of the predecessor companies. U.S. Borax & Chemical Corp. also announced that construction of their new research laboratory at Anaheim, Cal., is expected to be completed in April, 1957.



New Florida Office

The artist's conception of the new office building now being built in Ridgewood, Fla., for the Florida Phosphate Division, Davison Chemical Co. Division of W. R. Grace & Co.

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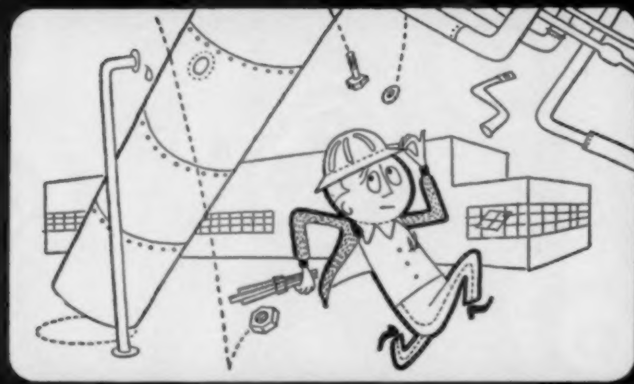

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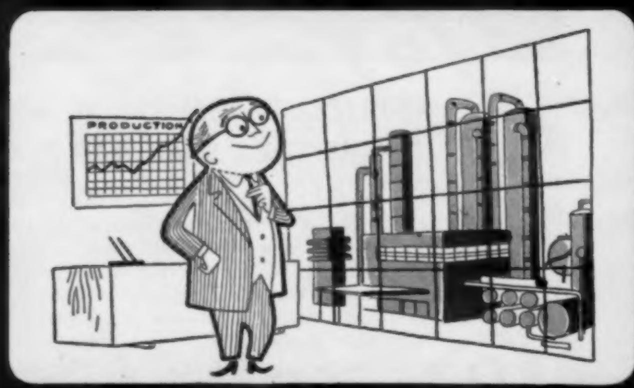

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Utah Bankers and NPFI Sponsor Soil Testing Program

Extension soil scientist Paul Christensen is placing soil in sample bag held by farmer Coe Larkin, while sample description form is being completed by James Thorne, in charge of Utah Soil Testing Laboratory. Banker Fred Thompson looks on.

Utah State Agricultural College, the Utah Bankers Association, and the National Plant Food Institute, jointly are sponsoring a program to promote increased use of soil tests by Utah farmers as a "tool" for increasing efficiency in agriculture.

The Institute is bearing part of the cost of the soil testing program, which includes supplying two soil sampling tubes, free, to any interested bankers in Utah. Bankers, in turn, lend the tubes to their farmer-borrowers.

Another phase of the joint program, includes the distribution of instructional leaflets and soil cartons by the college to the banks, free of charge.

Any Utah bank desiring soil sampling tubes, soil cartons, soil sample instructions, etc., may obtain them by writing direct to Mr. J. P. Thorne, Utah State Agricultural College, Logan, Utah.

•

Correction in Fungicide Tests

Table 45 of the article "'Results of 1955 Fungicide Tests," shows an incorrect heading. The correct statement is Tobacco blue mold control in seedbeds in South Carolina. Purchasers of the reprint (available through the American Phytopathological Society) should note this change in their reprints.

•

Pyrenone Insect Calendar

The Fairfield Chemical Division of Food Machinery and Chemical Corp., New York, has issued an interesting and informative "Pyrenone Pest Control Calendar" for 1957.

The two-color, wall-calendar contains the illustrations and descriptions of 24 common insects. The calendar has been widely distributed within the insecticide industry.

•

Wofford Agronomy Head

The Southern Nitrogen Company, Inc., Savannah, Ga., has named Dr. Irvin M. Wofford to the position of director of agronomy. He will work with agricultural research stations in the Southeast.

USDA Permits Use of DDVP

DDVP (Dimethyl 2, 2-Dichlorovinyl Phosphate), discovered by Dr. George Pearce of the U. S. Public Health Service, and manufactured by Montrose Chemical Co., Newark, N. J., is now permitted by the Department of Agriculture for use in fly-baits and for control of Phorids in mushroom houses.

Hitherto, DDVP has been authorized only for experimental use.

•

ASARCO Ups Arsenic Study

American Smelting and Refining Co., New York, a major producer of arsenic, stepped up their basic research program for arsenicals in 1956. Included in this work were research projects with various land-grant colleges and agricultural experiment stations.

The use of calcium arsenate as a cotton insecticide increased last year and is expected to increase again in 1957. Cooperative research programs are under way exploring organic arsenicals as well as the development of a compound with the characteristics of calcium arsenate that can be applied as a liquid insecticide.

•

Gen. Wooten Retires

Ralph H. Wooten, retired U. S. Air Force major general, has retired as executive vice president of Mid-South Chemical Corp., Memphis, Tenn. He is a former president of the American Anrydrous Ammonia Institute.

•

Cattle Tick Story Statement

An omission in the last paragraph of the article "Cattle Tick Control" (December, pp. 42-44 and p. 121, *Agricultural Chemicals*) by Dr. J. G. Matthysse, gives an inaccurate summary. The statement on page 121 should read "Only small European herds are adapted to pen spraying. Native owned cattle are probably best treated by pen spraying under complete organization, supervision, and operation by Veterinary Department personnel."

At the Agricultural Ammonia Institute meeting (story in December **Agricultural Chemicals**, pages 45, 107): R. A. Miller and H. D. Warren, at the Weatherhead Co. booth, L. Hansberger, United States Testing Co., N. T. Adams, Fred Hendrix and J. L. Risedon, J. B. Beaird Co., Inc., Grace Chemical Corp. sales meeting held during AAI convention. Mine Safety Appliances exhibit, and I. Edward Uzzo (right), demonstrating in "Pronto" Liquid Fert. Corp. booth.

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Equipment - Products - Bulletins

New Spraying Systems Valve

Spraying Systems Co., Bellwood, Ill., has introduced a new valve for selective spray control in boom spraying. With the new "TeeValve", spray operation of the three standard sections of a spray boom is said to be controlled easily and accurately for maximum convenience and economy.

The TeeValve is made in aluminum and stainless steel and features nylon valve seats which can be replaced merely by removing the outlet adaptors.

•

New Velsicol Technical Bulletin

Velsicol chemical Corp., Chicago., has just issued a new 16-page bulletin covering technical aspects of the firm's line of solvents for herbicides and insecticides. The bulletin is designed as an aid to formulators in selecting appropriate solvents for the various insecticide and herbicide formulations.

Velsicol lists the following specific properties of the solvents covered in the bulletin:

1. Chemical compatibility with herbicides and both synthetic and botanical insecticides.
2. A high solvency for insect toxicant materials and such herbicides as the 2,4-D and the 2,4,5-T esters.
3. Solutions of the insect toxicants and herbicides are stable over a wide temperature range.
4. The solvents have high flash points.
5. The solvents are non-corrosive to metals.
6. The high boiling range of these solvents (low volatility) favors the residual toxicity of the more volatile insecticides.

•

New Relief Valve Manifolds

A new pair of relief valve manifolds recently introduced by the Bastian-Blessing Co., Chicago, are expected to provide ample safety relief capacity for larger anhydrous ammonia bulk storage tanks.

Designated the "RegO A7564 and A7565 Relief Valve Manifolds," each model has a cast steel body with three ports and three aluminum relief valves. Additional information and literature is available from the manufacturer.

•

New Tractor Bucket

The Frank G. Hough Co., Libertyville, Ill., has announced the availability of the new Drott "4-in-1" bucket for rubber-tired front-end loaders.

This multi-purpose attachment had previously been available only on International-Harvester crawler models. The identification "4-in-1" comes from the fact that the attachment can be used as a shovel, clamshell, scraper, or bulldozer.

•

Transport Bodies Catalog

A new eight-page catalog, describing and illustrating the Baughman line of Bulk Transport Bodies, is now available from the Baughman Manufacturing Co., Jerseyville, Ill.

Hercules Insect Handbook

A 64-page booklet, "Handbook of the Insect World," recently published by the Hercules Powder Co., Wilmington, Del., contains 532 illustrations and is believed to be the first book to include likenesses of most of the common insects in one volume.

The handbook, which occupied researchers for over two years, also gives a brief description, classification by entomological order, and approximate size of each insect. Hercules is offering copies of the handbook without charge to agricultural leaders, teachers and other individuals who have a genuine interest in insects and insect control.

Hercules entered the agricultural chemicals field in 1946 with toxaphene, a base for agricultural chemicals. Since that time the company has produced a series of educational films, wall charts, and 23 short films for television as a part of their educational program on insect control.

•

New Uses for SR-406

A number of non-agricultural uses are being discovered for the fungicide SR-406 (known as Orthocide or Vancide, chemically as N-trichloromethylthio tetrahydrophthalimide) developed by Esso Research and Engineering Co. The material has had wide application for controlling and preventing fungus caused diseases, and is now used to make paint, raincoats, and a dandruff remover.

•

USDA Small Sprayer Booklet

The Agricultural Research Service of the United States Department of Agriculture has issued an illustrated booklet (ARS-33-34) containing instructions for the construction of a sprayer for applying insecticides to small plots.

With this sprayer, emulsion sprays can be applied more quickly and uniformly than with small compressed-air tank sprayers. The machine is easily cleaned. It can be pulled by hand, with a tractor, or with an automobile, and can be carried to any desired location in a pickup truck or a small trailer. The approximate cost of the materials needed for construction is $175.

Although the sprayer has been developed for treating small grains, it may easily be adapted to row crops by installing drops.

•

New Work Clothes Catalog

Worklon, Inc., New York, a manufacturer of apparel for industrial, commercial, and laboratory purposes, has issued a 16-page booklet describing their Orlon and Dynel work clothes, containing the results of laboratory tests on the fabrics.

Orlon, a product of DuPont, and Dynel, manufactured by Union Carbide, have proven to outlast ordinary work clothes by as much as 50 to 1 in resistance to acids and caustics.

•

New 3-Section Sprayer

The Century Engineering Corp., Cedar Rapids, Iowa, has introduced a new line of boom type sprayers which permit the boom arms, or wings, to be shorter and more stable. The new "A-3" line has a wide center with five rather than the customary three nozzles. Century reports that they have reduced the height clearance seven feet with the new unit.

•

Diesel Engine For Loader

Tractomotive Corp., Deerfield, Ill., has announced the availability of a diesel engine as optional equipment for the ½ cubic yard TL-6 Tracto-Loader.

The engine, manufactured by the Buda Division of Allis-Chalmers Manufacturing Co., is a vertical overhead valve 4 cylinder, 4 cycle, solid injection full diesel engine which develops 38 horsepower at the governed speed of 1900 RPM. It has compression ignition for starting and running, with ether priming as standard equipment and electrical preheating as optional equipment.

The overall length of the TL-6D with the bucket at a 3 foot carry level is 10 ft. 4 in., and the overall width is 4 ft. 5 in. These dimensions coupled with the TL-6D's turning radius of 6 ft. 8 in., make it ideal for handling bulk materials in confined areas.

New Conn. Station Review

Frontiers of Plant Science, semi-annual review of work in progress at the Connecticut Agricultural Experiment Station, New Haven, has been restyled in its ninth year of publication, it was announced last month. It presents a summary of some Connecticut Station "firsts" in the 81 years of its history, brought up to date by brief summaries of lines of work now under investigation.

•

Adams & Doyle Spreader

A heavy duty fertilizer, lime, and phosphate spreader is being manufactured by Adams & Doyle Equipment Manufacturing Co., Quincy, Ill. It is said to be the only spreader on the market that offers precision-built gear cases of hardened steel, with individually cut and spiral matched gears. The unit's 21-inch bottom permits application in any amount from 100 pounds to four tons per acre, and it has single or double fan units that are interchangeable. The spreader is available in sizes from seven to twelve feet.

•

Olin Mathieson Brochure

A brochure has been prepared by the Forest Products Division of Olin Mathieson Chemical Corp., New York, to explain how Kraft paper is made. The illustrated booklet explains the various facilities and techniques employed by the Forest Products Division, producer of Frostcraft paper, bags, corrugated containers, and multi-wall bags.

•

D-O Acid Pump Bulletin

Dorr-Oliver, Inc., Stamford, Conn., recently issued a new six-page bulletin, "The Olivite Acid Handling Pump." It describes the design features, corrosion-resistant materials, applications, sizes, and capacities of the pump. Capacity of the Olivite pump ranges from 5 to 1400 gpm, with hydraulic leads up to 120 feet. A choice of three sizes—1½", 2" and 4"—plus a choice of varying diameter impellers is offered. The company claims that temperatures close to the boiling point can be tolerated without damaging effect to the linings, or to their bond to the casing, cover, or impeller.


new source of high quality lime
...quicklime and hydrate
West End, supplier of quality chemicals for over 31 years, proudly announces expansion of its hydrate and quicklime production. Discovery of an extensive deposit of high grade limerock resulted in the construction of a large new processing plant. The photo shown here is of the giant 340 foot rotary kiln. The plant will soon be producing increased quantities of highest quality lime to serve the needs of growing western industry.
We suggest you give consideration to West End as a primary source of supply. Inquiries and your specifications are invited.
WEST END
West End Chemical Company
DIVISION OF STAUFFER CHEMICAL COMPANY
EXECUTIVE OFFICES, 1956 WEBSTER, OAKLAND 12, CALIF. · PLANT, WESTEND, CALIF.
SODA ASH • BORAX • SODIUM SULFATE • SALT CAKE • HYDRATED LIME

News Brevities

UNITED STATES STEEL CORP., New York, has announced that orders are being accepted for anhydrous ammonia and prilled ammonium nitrate for shipment from its new ammonia plant located at Geneva, Utah. The new plant has capacity to produce 70,000 tons of anhydrous ammonia, and 68,000 tons of prilled ammonium nitrate per year.

AC

THE VULCAN STEEL CONTAINER Co., Birmingham, Ala., has announced the appointments of John Carson, as superintendent, and Fred A. Kusta, as general plant manager.

AC

C. E. MCCABE, sales representative for Chase Bag Co., Chicago, since 1947, is now handling the sale of all Chase products in northern Illinois.

AC

JOHN M. TRYTTEN has been named director of marketing of the Nitragin Co., Milwaukee, an agricultural products manufacturer.

AC

ARTHUR E. HECKER, Pelham, N. Y., a former executive of the American Cyanamid Co., New York, died recently.

AC

MONSANTO TECHNICAL Service Members: Top (l) S. D. Daniels, (r) W. R. Bone. Bottom (l) J. H. McNeill and (r) J. E. Seymour. Story in January *Agricultural Chemicals*, Page 76.

E. T. DOYLE, district manager of Diamond Black Leaf Co.'s Western District sales office, San Jose, Calif., died recently after a short illness. Mr. Doyle was a founder and organizer of the Western Agricultural Chemicals Association 28 years ago and remained active in the association's affairs.

AC

DR. D. M. DOTY, assistant director of research and education of the American Meat Institute Foundation, Chicago, was elected chairman of the American Chemical Society's Division of Agricultural and Food Chemistry for 1957.

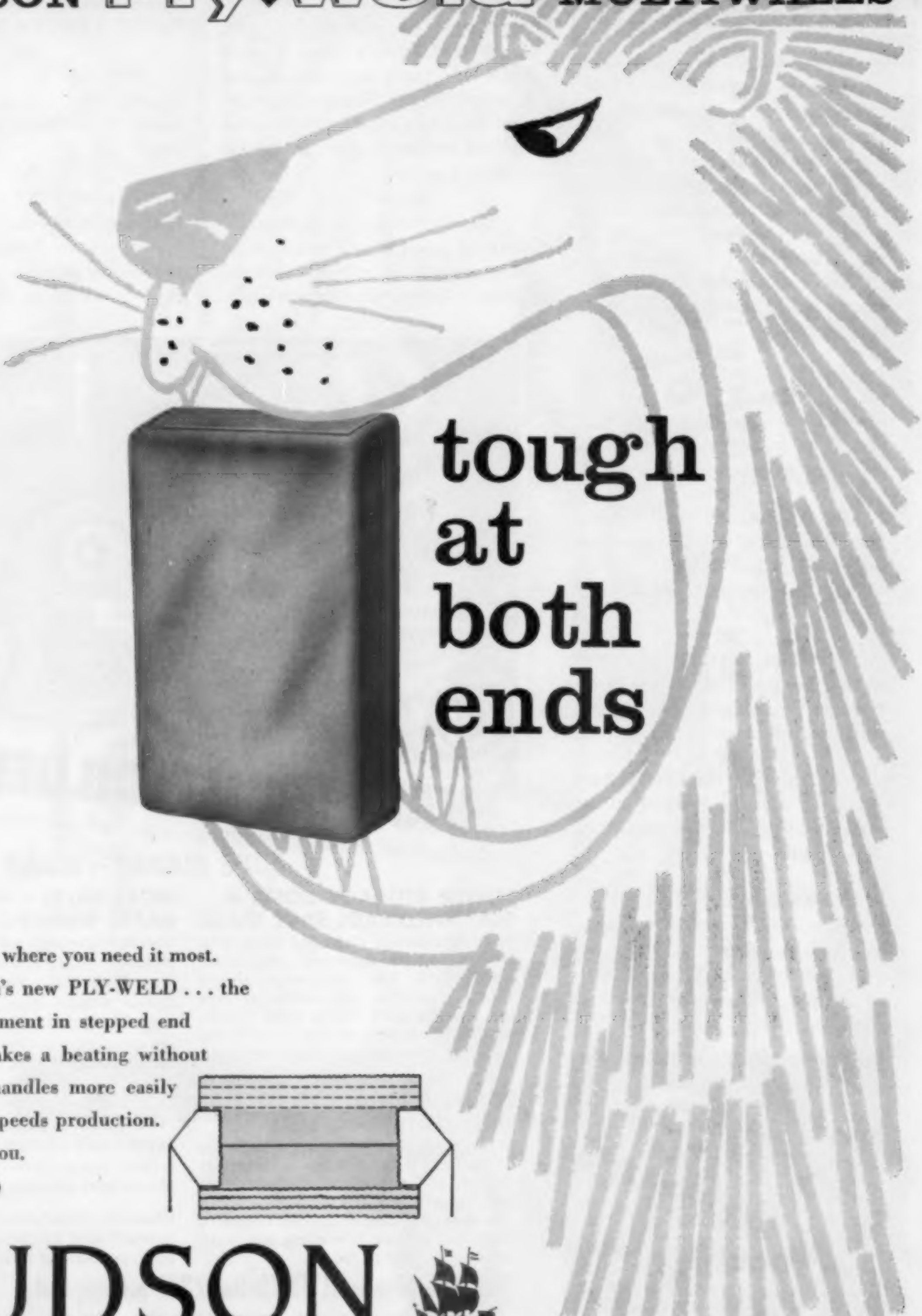
AC

WILLIAM W. THOMAS retired recently after 33 years with the California Spray-Chemical Corp., Richmond, Cal.

AC

THE NOPCO CHEMICAL CO., Harrison, N. J., has announced the appointment of Arthur M. Gladstone as technical manager of the Agricultural Chemicals department. He will

HUDSON Ply-weld MULTIWALLS



Extra strength where you need it most. That's Hudson's new PLY-WELD . . . the latest improvement in stepped end Multiwalls. Takes a beating without breaking . . . handles more easily at the spout, speeds production. Let us show you.

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Plants at PINE BLUFF, ARK. • PALATKA, FLA. • WELLSBURG, W. VA.

GERALD P. TINNEY has been appointed sales representative of Roberts Chemicals Inc., Nitro, W. Va., Mr. Tinney will handle sales of agricultural chemicals for the company in the eastern section of the United States.

AC

THE MEAD CORP., Atlanta, plans to spend more than $20,000,000 to expand its kraft paper mill at Rome, Ga.

AC

THE SANGAMON GRACE AMMONIA CO., Chicago, has been granted a charter to deal in fertilizers, insecticides, fungicides, and other agricultural chemicals in Mississippi.

AC

T. A. QUINN CHEMICAL AND FERTILIZER CO., Yazoo City, Miss., has been granted a charter of incorporation. Capital stock of the firm was listed at $25,000.

AC

THE PHOSPHATE ROCK EXPORT CORP., New York, has filed articles with the secretary of state office at Albany, N. Y., changing its capital stock from 300 shares at no par value to 6,000 shares.

AC

WYMAN L. TAYLOR has been made administrative assistant to the vice president, Pacific Coast, of Stauffer Chemical Co., New York. William H. Oliver has been named to fill Mr. Taylor's former position as Northern California sales manager. Both men are headquartered in Stauffer's San Francisco office.

AC

BENJAMIN M. HOLT has been appointed to the newly-created post of project director of planning and development of American Potash & Chemical Corp., Los Angeles.

AC

MICHIGAN CHEMICAL CORP., Saint Louis, Mich., has appointed Everett E. Klicker to the post of sales manager in the Rare Earths and Thorium Division.

AC

HARRY R. BRYSON, associate professor on entomology at Kansas State College, died at his home in Manhattan, Kans., recently. He was 64 years old.

WELCH, HOLME AND CLARK CO., New York, has issued a new data sheet which gives average characteristics, specifications and application information on Sesame Oil U.S.P.

AC

DOW CHEMICAL CO.'s Chicago sales staff has occupied new quarters in a recently completed office center at 6000 West Touhy in the northwest part of Chicago. The office formerly was at 135 South LaSalle St.

AC

S. B. PENICK & CO., New York, recently announced the addition of the following staff members: James B. Philip, who will work with the product development staff at Lyndhurst, N. J.; Gerald S. De Angelo, assigned to the analytical control laboratory at Lyndhurst; and Donald W. Sands, assigned to the Lyndhurst production group.

AC

THE MATERIALS HANDLING EXPOSITION is returning to the East after a four-year interval and will be held at Convention Hall, Philadelphia, April 29 through May 3. More than 100 different types of materials handling equipment will be demonstrated, such as fork trucks, hoppers, and load binders.

AC

THE STEPAN CHEMICAL CO., Chicago, has announced the appointment of William S. Rhoads to head the company's eastern sales office at 520 Fifth Ave., New York.

AC

THE BAGPAK DIVISION of International Paper Co., New York, has announced the opening of a new sales service office in Camden, Ark. The Bagpak Division manufactures multiwall shipping sacks.

AC

SMITH - DOUGLASS COMPANY, Inc., Norfolk, Va., has announced the addition of Nutro Soil Corrector, a combination of plant food elements with neutralizing qualities for sour and mineral deficient soils, to the company's Nutro line of home and garden plant foods.

AC

DR. J. D. CAMPBELL has been appointed agronomist for the newly formed North Central District of the Olin Mathieson Chemical Corp., Baltimore, with headquarters at Omaha, Nebr.

AC

SMITHFIELD FERTILIZER CO., has been granted charter of incorporation listing authorized capital stock of $100,000. Incorporators: Woodrow Jones and William Wiggs of Smithfield, N. C., and J. Q. Parnell, Sr., of Parkton, N. C.

AC

CARL A. VILL has been appointed assistant to the vice president of Chemical Construction Corp., New York, a subsidiary of Electric Bond and Share Co.

AC

HOLLAND R. WEMPLE has relinquished his duties as sales manager of the Texas Gulf Sulphur Co., New York, and A. Nelson Myers has been appointed to that position. Mr. Wemple is continuing as vice president of the company.

AC

ISAAC SWISHER has been named sales supervisor, direct application materials, in the Illinois district, it was announced recently by Nitrogen Division, Allied Chemical and Dye Corp., New York. He had been in charge of Arcadian 12-12-12 sales in the Midwestern area.

AC

THE AMERICAN POTASH INSTITUTE, Washington, D. C., has appointed Stantford Martin, Jr., as head of publications and director of publicity.

AC

ARKELL & SMITHS has completed the modernization and expansion program at their multiwall bag-making plant at Wellsburg, W. Va. A new warehouse has been constructed and existing facilities were expanded to accommodate new equipment for manufacturing the "Step-Flex" stepped-end bag.

AC

U. S. INDUSTRIAL CHEMICALS CO., Division of National Distillers Products Corp., New York, has announced the appointment of Alden R. Ludlow Jr. as director of sales. Mr. Ludlow succeeds Lee A. Keane, who has just retired.

N. E. WEED MEETING

(*From Page* 34)

and field crops have shown little or no Mylone present. Still, until adequate residue studies are completed, crops grown in treated soil should not be used for food or feed. J. W. Keays and R. J. Zedler, Carbide & Carbon Chemicals Corp., presented data on the new herbicide.

The pre-emergence application of 6 pounds of CDEC resulted in best weed control in butternut squash, reported W. H. Lachman and L. F. Michelson, Massachusetts Agricultural Experiment Station. Only Neburon affected yields adversely, they said, but further tests should be made.

NCWC Awards

The county agent award for 1956 was presented by S. Fertig to C. O. Cartwright, Essex County, Mass. Awards for the two most valuable reports presented at the conference were presented by John Van Geluwe to: (1) Albert J. Kerkin and Robert A. Peters for their paper on "Herbicidal Effectiveness of 2,4-DB, MCPB, Neburon and Other Materials as Measured by Weed Control and Yields of Seedling Alfalfa and Birdsfoot Trefoil." and (2) to W. C. Bramble, W. R. Byrnes and D. P. Worley, for their "Progress Report on the Effect of Chemical Sprays on Game Food and Cover on a Utility Right-of-Way."★★

EDITORIAL

(*Continued from Page* 29)

for the smaller bag of more concentrated toxicant. Fertilizer manufacturers ran into the same brand of sales resistance when they first started selling the higher analysis fertilizer mixes years ago, and there are still far too many farmers who feel they are being fleeced if they don't receive a backbreaking volume of plant food for their fertilizer dollar.

What's the answer? The only one we see is education. Education which must start with the approximately one hundred thousand dealers who handle these products. And, unfortunately, far too many of them are just as hard to educate as the farmer is. The dealer who is technically trained is a rare exception. So is the dealer who actually has much time left over from his normal pursuits to keep in touch with the vast volume of informative material published on agricultural chemicals and their use. The only media which are currently reaching enough of these dealers to do any real good are the house magazines published by agencies like the National Plant Food Institute, American Potash Institute, Agricultural Ammonia Institute, Nitrogen Division, Spencer Chemical and others, primarily in the fertilizer field. As for educating the dealer on insecticides, however, there is still a tremendous job to be done.★★

PESTICIDE RESIDUES

(*From Page* 40)

the vanishing point in a definite number of days, regardless of the magnitude of the initial deposit. Actually, when the same data is replotted as shown in Fig. 3 it appears that the 1, 2, 4, 10 relationship would be carried on to infinity, but that after X number of days all plots would show residues below the tolerance requirement and soon thereafter all values would be so low as to be beyond the decimal point and therefore of little practical consideration. Nevertheless, the second method of presentation (Fig. 2) has merit in that if and when valid data are available for plotting one can at a glance determine the day or date a given residue may be expected to reach the tolerance or any other specified level.

Fortunately, most if not all of the variables likely to be encountered have been taken into account in the requirements and rules for the establishment of tolerances and the registration of labels. Thus, if one adheres closely to label instructions and/or the recommendations of reputable authorities, there is little danger that harvest residues will exceed established tolerances. In fact, several surveys strongly indicate that crops treated in accordance with label instructions will in general end up with residues well under tolerance levels.

Boxcar has only 5' door, sand piled level, floor rough, yet . . .

Michigan Tractor Shovel unloads entire 60 tons in less than 100 trips

"This was about the toughest boxcar unloading job a tractor shovel could get!" describes this Midwestern foundry's plant engineer.

"The car had a narrow 5-foot Canadian-type single door. Its floor was fairly rough. Its load of 60 tons of silica sand was piled almost level. Frankly, we didn't think our Michigan could unload it, but decided to give it a try."

200 ft cycles in 1 minute

"First thing we noted," says the operator, "was that Michigan's greater bucket capacity, power and instant shift more than made up for whatever slight maneuverability advantage smaller tractor shovels are supposed to have. Turning past the narrow door slowed the Michigan a bit, but I was always able to get in and out of the car without trouble. Loads averaged 10 to 15 cubic feet of sand each. Cycles of 200 feet between unloading point and boxcar took only a minute or two."

Unloads regular cars under 80 trips

Entire job took only 97 trips. Time compared favorably to unloading 50 to 60 tons of sand from a car with 6-foot door. "We receive 15 to 20 of these per week," says the engineer; "Michigan rarely needs more than 75 to 80 trips to unload any of them." Other Michigan assignments include cleaning the foundry floor . . . moving new sand from hoppers to shakeout bin . . . supplying the gray iron moulders.

Expect longer life

"We first noticed this 15 cubic foot Model 12B at a trade show," reveals another company official. "Here we got convincing proof of the longer machine life its planetary axles and torque converter would provide. We also felt its higher lift would make it easier to do some of our loading and unloading."

And less trouble

"Lower repair time was another expected gain," says the general foreman. "We've had Clark fork lifts and industrial trucks for years; they outlast all others by far. When we saw the same ruggedness built into Clark's Michigan Tractor Shovel, we bought it."

See it in action

Study a Michigan first-hand to see how these advantages can pay off *in your plant.* We'll be glad to let your operators run a demonstrator . . . glad to help you measure output on the type of jobs you want to see done. Call your nearest Michigan distributor to arrange details. For his name and address, send a postcard to:

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CLARK EQUIPMENT COMPANY
Construction Machinery Division
2463 Pipestone Road
Benton Harbor 6, Michigan

CLARK® EQUIPMENT

One of the problems yet to be solved concerns pesticide residues on forage crops. It seems probable few if any additional tolerances for pesticides on forage crops will be established until the delicate and knotty question of chemical residues in milk has been resolved. On the other hand, there is reason to hope tolerances for several pesticides in the fat of animals or meat (beef, pork, lamb, etc.) will be forthcoming at an early date. Thus we may have approved labels that will permit the use of pesticides on forage to be fed to meat animals but specifying that crops so treated may not be fed to dairy animals or introduced into interstate commerce. If this should come to pass, it behooves all of us to not only adhere to the line for our own protection, but to join forces with others in conducting an educational campaign that will clearly demonstrate to all concerned that such a system can and will work. To this I might add there are persistent rumors that DDT and perhaps other pesticides are appearing in milk and the implication is that such milk contamination is attributable to contaminated feed, despite the fact that it seems far more probable milk contamination could be traced to the improper and illegal use of one or more pesticides as animal sprays in violation of label instructions. This is a serious matter, for the future of pesticide usage on feed and forage crops is to a very large extent contingent upon the solution of this problem. Here again, we all share responsibility for the development of an educational program that will eliminate or at least aid in the detecting and correcting of such illegal practices.★★

SAMPLING

(*From Page* 63)

a granular sample. The analysis reported in column 1 (Table 2) represents the analysis of a sample of about a 3 gallon size which was reduced to ½ pint size by the standard riffling method. The results under column 2 represent the analysis of a 3 gallon size sample reduced to ½ pint size by the standard quartering method. The results under column 3 represent the analysis of a 3 gallon size which was reduced to ½ gallon size by riffling, followed by quartering the ½ gallon size sample to ½ pint size. The work was in duplicate and the variance between duplicate sampling and analysis is indicated in column under *variance*. This shows a grand average variance of .12 for the riffling method, a grand average variance of 0.32 for the quartering method and a grand average variance of .31 for combination of the two methods. The results shown under columns 4, 5, and 6 are the analyses of samples prepared as in columns 1, 2, and 3, except the entire sample was ground 85% to pass 20 mesh before the size of the sample was reduced. It is observed that the variances in these samples is much less than the variances of the samples which were reduced without grinding. In fact, the variances on these samples are

TABLE 2.

Analysis of Plant Granular Samples Reduced to Laboratory Size by Different Methods (Plant Size = approximately 3 gallons)

		Plant sample reduced to ½ pint size by riffling method			Plant sample reduced to ½ pint size Quartering Method			Plant sample reduced to ½ gal. size by riffling method Then ½ gal. sample reduced to ½ pint size by Quartering Method			
		Column No. 1 Sample No. 1	Sample No. 2	Var.	Column No. 2 Sample No. 1	Sample No. 2	Var.	Column No. 3 Sample No. 1	Sample No. 2	Var.	Average of columns 1-2-3
	N	9.49%	9.53%	.04	9.17%	9.45%	.28	9.29%	9.45%	.16	9.40%
10-20-10	APA	20.59	20.70	.11	21.37	20.93	.44	21.15	20.37	.78	20.58
	K_2O	10.30	10.37	.07	10.00	10.20	.20	10.08	10.42	.34	1023
			Ave.	.07		Ave.	.27		Ave.	.43	
	N	14.70	14.80	.10	14.00	14.52	.52	14.95	14.60	.35	14.60
15-15-0	APA	17.49	17.30	.19	18.29	17.60	.69	16.78	17.28	.50	17.46
	K_2O	—	—		—	—		—	—		—
			Ave.	.15		Ave.	.61		Ave.	.43	
	N	10.20	10.20	.00	10.35	10.35	.00	10.10	10.30	.20	10.25
10-10-10	APA	11.12	11.54	.42	11.23	11.26	.03	11.46	10.89	.57	11.25
	K_2O	8.64	8.65	.01	8.95	9.03	.08	8.62	9.10	.48	8.81
			Ave.	.14		Ave.	.04		Ave.	.42	

well within the limits of the analytical accuracy. The results reported in this chart indicate that if a sample is first ground its size can be reduced by riffling, quartering or a combination of the two methods.★★

COPPER NAPHTHENATE

(From Page 35)

is evidenced not only in southern pine. Tests of pressure-treated (before gluing) Douglas fir seven-ply 1/8" veneer (7/8" stake size) plywood stakes were made in December 1952 after seven years exposure.

	x	xx	†
Copper naphthenate	100	0	0
Pentachlorophenol	30	70	0
Coal tar creosote	100	0	0
Ch. Zinc Chloride	70	30	0
Acid Cupric Chromate	90	10	0

Among advantages claimed for copper naphthenate as a wood preservative, Triangle Chemical also lists:

1. Safety to warm-blooded animals and plants.
2. Solubility in all petroleum solvents.
3. It is practically odorless when diluted.
4. It will not corrode metal and can be stored indefinitely in ordinary containers.

With the increased use of copper naphthenate as a wood preservative in agriculture, it is conceivable that there will be a resurgence of popularity for the use of wood for fence posts and for general farm use.★★

DRYING & COOLING

(From Page 32)

amount of air required to carry off the moisture, because it leaves the dryer at a higher temperature.

In the countercurrent flow dryer the highest material temperature occurs at the discharge end. On the other hand, the condition of highest relative humidity exists at the material feed end. The fertilizer is more likely to leave the dryer in a hotter condition and a relatively large amount of air will be required to prevent condensation at the discharge end. This condensation could take place on the surfaces of the relatively cold material entering dryer at this end.

The hot gas flow can be parallel or counter-current. Parallel flow is especially suitable for heat sensitive chemical fertilizers, since the high initial rate of evaporation maintains a solids temperature well below 212 degrees F., and instantly cools the surrounding gases. The high allowable inlet air temperature and the low product discharge temperature make thermal efficiency relatively easy to attain. However, extremely low moisture contents cannot be obtained in parallel flow dryers because the product leaves the dryer shell in contact with the vapor laden exhaust gases.

From calculations based on equipment sized for a typical plant producing 20 tons per hour of finished granular fertilizer (40 tons throughput), it can be shown, for example, that approximately twice the quantity of air is required where counter-current drying is used as contrasted with that needed for a concurrent (or parallel flow) dryer installation. Since twice the amount of air is required in the case of counter-flow drying 20

tons per hour, the drying unit must be larger to compensate for the increased air velocity.

On the other hand, almost three times the quantity of air is required to do the same amount of cooling in a parallel flow cooler as compared with a counter-current cooler. Therefore, a larger parallel flow cooler would be needed.

Phases of Drying

THE DehydrO-Mat by Edw. Renneburg & Sons, was designed for drying heat sensitive materials at rates that vary as the charge moves through the unit from the throat to the discharge end. Like other concurrent flow adiabatic dryers, this unit uses high temperature gas in contact with the wet charge to effect rapid, initial drying and then continues with steadily decreasing gas temperature and increasing humidity as heat flows into the charge from the gas, and as water evaporates from the charge into the gas stream.

As long as there is moisture diffusing to the surface of the material fast enough to keep the surface damp, the fertilizer remains at the bulb temperature of the gas, even though the actual gas temperature is hundreds of degrees above that of the fertilizer. Only when the rate of evaporation from the surface of the fertilizer exceeds the rate of diffusion from the interior of the particles does the surface become dry and its temperature start moving up. This is the principle upon which all parallel flow dryers depend to keep the fertilizer from being overheated during the most of its travel. For the final reduction of moisture to "commercial dryness," the gas should have lost so much temperature that it will not harm the dry product. The Renneburg dryers use this principle to an advantage because of the varying diameter throughout their length. It is a recognized fact that the movement of wet charge should be rapid during the initial contact with very hot gas, because less time is needed to evaporate water when there is a large temperature difference. Rapid movement of the fertilizer is of further advantage in constantly exposing new surfaces to the hot gas and in improving heat transfer by greater gas velocity over the surface of material.

Higher temperatures and air flows can be used in the constant rate drying section because moisture evaporation holds the particle temperature at the wet bulb point. The drying rate will be high, so the conveying can be fast. Lower temperature will be used in the falling rate section, where the product temperature will approach that of the heating medium. The rate of drying in the falling rate section will be relatively independent of the air velocity, so lower air flow rates can be used. Since air flow rate will be lower, the bed depth can be increased, and since drying will be slower, in the falling rate section, the holdup time should be increased.

In some dryers, efforts have been made to slow down the movement of the solids at the falling rate period of the drying cycle by changing the pitch of lifting flights. However, we felt that the increased mass of gas resulting from the addition of water vapor was certain to pickup and convey more and more partially dried material of decreased weight. As a result, much of the fertilizer would be transported by the relatively high velocity gas, and thus its retention time in the conventional dryer would be reduced in the zone where longer time is really needed. The conventional solution in the straight shell dryer has been to design the entire dryer larger to meet the low velocity requirements in this section.

The idea adopted for the DehydrO-Mat Dryer was to increase the shell diameter in this section and thereby reduce the gas velocity here to the desired rate—that is, to size the various parts of the dryer to conform to the theory of drying. After planning for suitable gas velocities throughout the length of the unit, we decided that we could set the dryer horizontal rather than sloping toward the discharge end as most units are arranged.

Recent Developments In Furnace Design

CONVENTIONAL dryer furnaces normally require the installation of insulation and refractories which add considerably to the overall cost of the dryer installation. In the larger fertilizer plants insulating refractories often cost as much as $4,500.00 to $6,000.00. A double shell refractoryless, gas-fired steel combustion chamber developed by Edw. Renneburg offers considerable savings over the conventional furnace. Sizes of the unit range up to approximately 15,000,000 BTU per hour capacity.

DehydrO-Mat Cooler

Patents Pending

THE DehydrO-Mat cooler is a counter-current unit, similar in external appearance to the dryer, but operating in a very different manner.

Air is used to introduce the material into the feed end of the cooler in such a way that the dust-spilling problem, so often experienced in straight shell counter-current units, is eliminated. This is achieved by a design employing a concurrent or parallel flow of air and material for a short section of the cooler feed end.

Because of the big diameter section following the feed section, a large volume of air can be drawn against the flow of material before dusting occurs or material movement is obstructed. At the narrow discharge end, fine material cannot leave except through the rotating unloading chute or valve.

The unloading, and thereby the hold-up time, can be controlled by (1) adjusting the speed of rotation or (2) adjusting the overflow of the material into the unloading chute by the regulating valve.

Although we have designed and manufactured both parallel flow and also counter-current types of coolers, from our experiences we have found that the counter-current cooler has far greater capacity and is considerably more efficient than the parallel flow or concurrent unit. For example, in one granular fertilizer plant using a DehydrO-Mat counter-current cooler approximately 35 feet long we have cooled up to 40 tons or more per hour of finished granular fertilizer of various grades of materials. The product entered the cooler from

the dryer at 240° F and 2½% moisture and was discharged from the cooler at 110° F to 120° F with 1½% moisture in the finished product.

Single Air Handling System for Both Drying and Cooling

SOME of the advantages of a single air-handling system for both drying and cooling are as follows:

1. Because the same air is being used for both cooling and drying, only one air-handling system (collector, ductwork, fan and drive) is required.
2. The heated air from the cooler is no longer wasted but put thru the dryer, resulting in fuel savings.
3. Cuts air pollution problem in half.
4. This system is particularly attractive where screening takes place ahead of cooling the finished product.
   (a). Send hot fines to ammoniator/granulator;
   (b). Cooler required to cool only the finished product; and
   (c). Greater cooler capacity.

To summarize, after consideration of all of the factors, we are of the opinion that the drying and cooling of ammoniated, granular fertilizers can be best accomplished in parallel flow dryers and counter-current coolers.★★

A Fertilizer Equipment Bulletin is offered by Edw. Renneburg & Sons, Baltimore, giving further details and illustrations of their coolers, furnaces, dryers, etc.

MORE ON DRYING

(From Page 32)

I will discuss parallel-flow drying in a straight tube. I prefer the word parallel to con because con can be misunderstood to be counter.

You know now that a counter-current drier theoretically is more efficient. However this efficiency cannot be fully realized in fertilizer drying, because of possible overheating of the material, and some grades are heat sensitive, that is, the materials will decompose if heated to too high a temperature. In a parallel flow drier, the hot gases contact material that is wet, and the evaporation of the water from the particles cools the particles. Regardless of the gas temperature, the particle temperature will be below 200+°F as long as water can evaporate freely from the surface of the particle. As the water content of the solids drops, the temperature of the solids can increase, but by then they have progressed down the tube where the gas temperature is lower.

So parallel flow drying is somewhat of a guarantee against overheating.

Because of the high gas temperature in contact with moist particles, parallel flow results in case-hardening, just like searing a steak. Case-hardening is a good thing on high analysis nitrogen goods like 12-12-12 because it minimizes the possibility of further agglomeration in the drier with resultant excessive oversize. On the other hand, case-hardening is not desirable on low nitrogen goods like 5-10-10, where granulation is difficult and the added agglomeration in a drier minimizes fines. Furthermore, in plants that do not have a granulating section, either as part of the ammoniator or as a separate piece of equipment, granulation takes place in the drier. Because of the case-hardening feature of parallel-flow, it is not the preferred type drier if a substantial portion of the granulation is to take place in the drier. Therefore, the relative percentage of high and low nitrogen grades and the presence or absence of a granulator will determine whether you should install a parallel-flow or a counter-current drier.

Now for some side comments—

Have the drier equipped with staggered rows of flights. I believe a flight running the full length of the drier is not desirable, because there is always the possibility of granules rolling along the flights without spilling over. Drying takes place when the particle falls through the gas stream, so the more times the particle falls, the more efficient the drying action.

In parallel-flow, the hot gas enters at the feed end. The feed chute enters the drier also at the feed end.

If the hot gas surrounds the feed chute, various troubles result. Corrosion is increased and the half of the feed chute facing the flame must be of stainless steel. Sticking of the feed to the hot chute is accelerated, and when sticking occurs, it is difficult to remove the crust because it has to be done through the feed chute opening.

On the other hand, if the feed chute enters the drier alongside the hot gas duct, the chute can be fabricated of mild steel or even rubber belting. Furthermore, rapping devices can be installed on the chute to minimize caking.

Next, provide automatic temperature control for the drier. Have the flame governed by the exit stack gas temperature. Then regardless of the variations in feed rate and feed moisture (as long as they are within the capacity of the drier) you will have a uniform moisture content in the product. Then provide about a 4-foot section near the feed end free from flights to permit some final hardening of granules in a drying atmosphere before they begin to be lifted up and dropped from the flights. Flight action occurring too early will break-up the granules.

Finally, do not make the drier too small. For normal recycle (between 25-50%) and with normal formulations that result in a drier feed of about 5-8% moisture, the drier should be about 8 feet in diameter and 50 feet long for a 20 ton per hour production rate. The exhaust fan should be capable of handling about 30,000 CFM of hot gas.

A drier 8 by 50 allows the material to remain in it for from 20 to 30 minutes. This retention time is necessary if drying is to be done with fairly low inlet gas temperatures, below 90° F.

Summarizing,

1. The more dry your product, the longer will it stay in satisfactory condition.

2. For low nitrogen goods with no preliminary granulating step use a countercurrent drier.

3. For high nitrogen goods with a preliminary granulating step, use a parallel flow drier.

4. Do not let the hot gas surround the feed chute.

5. Provide a short smooth walled section near the feed end.

6. Do not skimp on the size of your drier.★★

SELECTIVE INSECTICIDES

(*From Page* 37)

even when proved in the laboratory and in pilot experiments, prove economical? The generally accepted policy of insecticide research assumes that the wider the spectrum of pests which an insecticide kills the better, because the heavy cost of developing a new product can be written off over a larger turnover, making it possible to market the material at a lower unit price than is practical with a selective chemical which can only be used against a limited number of pests or on a limited number of crops. But this assumption may prove false if the action of the more general chemical over a long period leads to the development of resistance, first necessitating more and more treatments at a stronger dosage and finally ending in defeat, with yields perhaps lower than before the treatments were started. Is this perhaps a case of "penny wise, pound foolish"? In the light of recent developments, it seems that in the long run the selective approach will be found cheaper, because despite a higher initial cost per acre, the cure is more permanent and there is no danger of resurgence, of ever growing losses, and ever greater outlay on higher and higher applications per acre.

It is therefore in my view important that governmental research institutes and scientists in the chemical industry should co-operate in deciding the merit of the integration of biological and chemical control, to work out suitable methods and develop them in agriculture on a uniform plan. In this way our rather heavy footed incursion into nature with chemical warfare will be transformed into a real mastery of the situation based on knowledge of ecol-

ogy and toxicology and techniques derived from them. In the years ahead, when the problem of world food supplies again comes to the fore. this may prove of crucial importance, but in the meantime it will enable the agricultural industry to continue to enjoy the benefit of enormous yield increases at present obtained by chemical control.

(1) Ripper, W. E., The Influence of Pesticides on the balance of Arthropod Populations. *Ann. Rev. Entomol.*; 1, 403-38 (1956). Most of the relevant literature up to 1955 will be found in this review.

(2) Ripper, W. E., Experiments on the Integration of Biological and Chemical Control of Insect Pests. Proc. X International Entomol. Congress, Montreal (1956), in press.

(3) Wain, R. L., Herbicidal Selectivity through Specific Action of Plants on Compounds Applied, *J. Agr. and Food Chem.*, 3, 128-130 (1955).★★

DAVISON PROCESS

(*From Page* 42)

cator lights connected to the wet mixer surge hopper; emergency stop buttons for the burners.

The pug mixer is shown in figure two. Dry raw material flows from the poidometer, and the recycle return chutes are noted in the top left of this picture. The liquid distribution piping arrangement is shown on the left side of the pug mixer. A water flowrater is in close proximity to the wet mixer discharge control point. Slight fan suction is maintained on the top of the wet mixer.

The positive action agglomeration features typical of a double shaft pug mixer accomplish the ammoniation and granulation steps simultaneously. The pug mixer design, and the control of the paddle arrangement are planned to permit mixing and retention of the liquids and the solids. The pug mixer is used as the ammoniator-granulator, due to its many flexible features. It is thought that in addition to the positive action of the paddles, the ability to introduce large amounts of liquids at many submerged locations and to control the wetness economically, the ability to adopt many types of formulation practices, and to return the recycle portions wherever desired in this flat top mixer, are some of the advantages possible with this type of mixer.

A liquid distribution piping arrangement is shown in figure 3. This system introduces all of the liquids from one side of the pug mixer. The header provides for all nitrogen liquids to enter through the larger pipes at the top, and the acids to enter through the pipes nearer the shell of the mixer. Anhydrous ammonia enters the pipe near the pug mixer feed end, and the nitrogen solution enters the pipe at the other end. By valves we can regulate the number of points of introduction for either liquid. This same practice is followed for bringing the acids, sulfuric and phosphoric, into the manifold from opposite ends and valving off to control the number of distribution points. Water can be introduced into the nitrogen manifold for making an aqua ammonia solution. Air blow out connections are provided to keep the pipes open, if they become momentarily clogged. Premixing the ammonia containing liquids and the acids is accomplished in the pipes near the mid-point of this mixer.

The burners and the furnace of the dryer and the discharge end of our cooler are shown in figure 4. The materials flow from the wet mixer into the dryer; into an elevator; and back through a cooler located parallel to the dryer. A straight tube dryer and the "DehydrO-Mat" designed for large volumes of air and a large BTU output capacity are employed. The cooler is equipped with an extension of heavy wire cloth for the purpose of screening out any large object which could damage the oversize disintegrator. A magnetic pulley is incorporated also into the design of the conveyor belt feeding the classifying elevator.

The product from the cooler is brought by elevator to the classifying screen shown in figure 5. This screen is a standard 4'x15' W. S. Tyler double deck hummer screen equipped with equivalent 6 and 16 mesh (U. S. Standard) Ty-Rod screen cloths. The dryer fan and the top

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of one of the two dryer cyclones are shown on the left. In this installation American Air Filter Rotoclones are used to remove particles smaller than can be removed by the conventional cyclone. The cooler fan and one of the two cooler cyclones are shown on the right.

The oversize particles from the classifying screen are brought by gravity through a chute to the pulverizer shown in figure 6. These particles are "cracked" and then returned to the classifying elevator, or are returned to the recycle elevator in the case of the grades formulated with a high ratio of liquids to solids. These latter grades require additioned recycle portions for control of wetness, particle size, and reaction temperatures. The chute on the front left is the oversize chute to the cage mill; the chute immediately behind, is directed to the right and goes down in the product chute; and the next chute behind this is the fines chute, which takes the material to the recycle elevator, or to the product belt, in the case of a "semi-granulated" grade. The classifying elevator is in the background with the mixed raw materials elevator parallel and behind. The stairs on the right come from the second or pug mixer—control room floor. The first flight of steps up goes to the raw material hoppers, and provides an access to the wet mixer surge hopper which feeds the poidometer. The next flight of steps up leads to the raw materials and classifying screens, the dryer and the cooler fans, and the tops of the dryer and the cooler cyclones.

Formulating and Operating Practices

THE Davison-Trenton Process is characterized by the ability to conform to many types of formulating practices, which is extremely desirable due to the changing economic conditions of our industry. This process is adaptable to formulas which use large amounts of nitrogen solutions, phosphoric acid, sulfuric acid, anhydrous ammonia, and water, either individually or in combination with one or more other liquids. We control the complete liquid phase by means of recycle control to achieve a non-slurry condition, but to still achieve a satisfactory penetration of the liquids into the solids.

Reference

(1) Reynolds, Jr., J. E., Alfrey, N. K., and Rose, G. W. "Davison's Trenton Process For Ammoniating and Granulating Fertilizers." Presented at the 130th National Meeting of the American Chemical Society, Atlantic City, New Jersey, September 1956.★★

MARSH AVIATION

(From Page 43)

Considering the risks involved in each job undertaken by an agricultural flying firm, too much importance cannot be placed on insuring an adequate return. Aside from physical damage to the pilot or airplane, there exists always the possibility that neighboring farmers may sue for damages inadvertently caused by the chemicals. This is where good public relations work also comes in. It is important for the operator to become acquainted with many groups and organizations in his area. By making people "agricultural aviation conscious," Marsh has been able to eliminate a great many nuisance claims and has kept its operations on a profitable basis.

Convinced that the majority of aerial applicators are not qualified to handle chemicals correctly or efficiently, Marsh has turned that part of the operation over to the chemical manufacturers and dealers themselves. Adoption of this system, Marsh feels, has provided the farmer with the services of two well-qualified firms, the chemical organization and the agricultural flying firm.

Looking toward the future of agricultuural aviation, the Marsh Aviation Co. sees great promise and is anticipating further expansion of their rapidly-growing organization.

Marsh regards agricultural aviation's present position as similar to that of the commercial airlines of 20 years ago. With adequate financing and foresight on the part of the individual operators, mergers to form nation-wide organizations will become both possible and profitable.★★

PROFESSIONAL

Directory

ALVIN J. COX, Ph.D.
Chemical Engineer and Chemist

(Formerly Director of Science, Government of the Philippine Islands. Retired Chief, Bureau of Chemistry, State of California, Department of Agriculture.)

ADVISER ON AGRICULTURAL CHEMICAL PROBLEMS AND INVESTIGATIONS

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SCHWARZ LABORATORIES, INC., Mount Vernon, N.Y., has announced a change in the pricing policy of its fine chemicals. Under the new policy, shipments will be F.O.B. destination at current prices. Previously, prices were F.O.B. Mount Vernon.

AC

MAURICE E. DUFOUR and Forbes K. Wilson have been elected vice presidents of Freeport Sulphur Co., New York.

AC

THE POTASH COMPANY OF AMERICA, Carlsbad, N. Mex., has appointed Harry Carroll as sales representative for Texas, Louisiana, Mississippi, and portions of Arkansas and Alabama. He succeeds Shelton Appleton, who has been transferred to PCA's Midwestern territory.

AC

E. G. MUIR, sales manager for the Omaha Sales Division of Bemis Bro. Bag Co., St. Louis, Mo., has been named to head a newly designated sales development section of the company's General Sales Department in St. Louis.

AC

WILLIAM B. GERY, director of the industrial and technical equipment division of the Stamford, Conn., plant of the Dorr-Oliver Co., Inc., died recently at Norwalk, Conn. He was 60 years old.

AC

SAFETY CLOTHING & EQUIPMENT CO., Cleveland, has issued a new line of protective clothing made from nylon impregnated with a resin compound. The clothing is suitable for use in industrial plants and chemical plants.

AC

DONALD L. LE CUREUX has been named assistant manager of the American Agricultural Chemical Company's Saginaw, Mich., sales office. Formerly, Mr. LeCureux was a salesman for the Saginaw office.

AC

IMPERIAL CHEMICAL INDUSTRIES OF AUSTRALIA AND NEW ZEALAND LTD., Brisbane, Queensland, has started construction of modern cattle pens at D'Aguilar, 50 miles north of Brisbane, as part of a new cattle tick research station. The pens will be used in an attempt to find better methods for controlling cattle ticks.

AC

MAINTENANCE ENGINEERING CO., Philadelphia, has produced a new compound for concrete floors containing anti-bacterial ingredient.

AC

POPE PIUS XII addressed scientists from 23 nations attending the Fourth International Congress on Orthocide held in Rome, Nov. 26 to Dec. 1, under the auspices of California Spray-Chemical Corp., Richmond, Calif.

AC

JOHN S. SULLIVAN has been appointed special sales representative for agricultural products in the Overseas Division of Monsanto Chemical Co., St. Louis, Mo. Mr. Sullivan, whose headquarters are at St. Louis, will travel extensively in Mexico, Central America, Hawaii, and other important agricultural areas.

SHELL WORKSHOP

(*From Page 44*)

supplements of advertising on the direct selling efforts in the major soil fumigant markets. He told of Shell's planned advertising coverage which will reach more than 10,000,000 people in the important nematode areas at the height of the nematocide selling season.

Summarizing the aims and accomplishments of the workshop, Dr. S. H. Benedict, Agricultural Sales Division of Shell, reviewed the points stressed by the speakers. He urged the audience to aid in the dissemination of the information presented that day and told of the many aids Shell has prepared for spreading the nematode story.

At the present time, Dr. Benedict explained, nematode control is limited to crops of high cash value. As the problem becomes more widely recognized, and more people become engaged in nematode research, the development of more efficient nematocides can be expected which will help all farmers to reduce much of their nematode losses in the years to come.

GRASSHOPPER CROP

(*From Page 63*)

lem. The expected problem, however, is up for the coming season over that expected in 1956 in Wisconsin, Iowa, Missouri and perhaps Kansas.

The number of acres of rangeland expected to have potential grasshopper problems is up only very little; 22,000,000 infested acres expected in 1957 compared with 20,000,000 acres in 1956. The real picture though is the shift in states where the problems may be expected. Arizona which in 1956 expected trouble on only about 140,000 acres of rangeland has a potential acreage of over 2,500,000 expected this coming season. It might be pointed out that the Arizona problem in 1956, due to weather conditions, did not materialize until very late in the season, with long-scale spraying programs going into the latter part of September.

The expected increase in the state of Colorado is from about 770,000 acres in 1956 to slightly more than 1,000,000 acres this year. Kansas shows an increase from approximately 1,000,000 to 2,000,000 acres. Another state doubling the expected range acreage is Montana which will increase from about 1,350,000 to slightly over 3,000,000 acres. New Mexico potential rangeland infestation remains about the same as for 1956, that is; 2,500,000 acres. The acreage in Oklahoma is down, but is still a little over 1,000,000 acres. The potential infestation in Texas is only about one-half of that expected in 1956, but still over 4,800,000 acres could have a grasshopper problem in 1957.

As in the case of all insects, weather factors play a decisive part in the development of expected infestations. The potential, however, is present for some problem areas.

The largest control programs for Mormon crickets may be expected in Montana where approximately 250,000 acres show potential infestation, in Wyoming some 32,000 acres may require control and in Nevada where it is expected that approximately 28,000 acres may be infested.★★

Classified ADVERTISING

Rates for classified advertisement are ten cents per word, $2.00 minimum, except those of individuals seeking employment, where the rate is five cents per word, $1.00 minimum. *Check must accompany all classified advertisements.* Address all replies to Classified Advertisements with Box Number care of AGRICULTURAL CHEMICALS, P. O. Box 31, Caldwell, N. J. Closing date: 10th of preceding month.

Miscellaneous:

WANTED: Used 20 ton hopper trailer unit suitable for transporting phosphate rock and other fertilizer materials. Address Box 153, c/o Agricultural Chemicals.

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Pictures of Southern Insects, plant diseases or nematodes. Black and White or Kodachrome slides. Make your ads or sales folders live — use photographs. Lewis Maxwell, 506 Hollywood, Tampa, Florida.

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DR. TIBOR KOPJAS, an escaped Hungarian scientist, has been employed at California Spray-Chemical Corp.'s formulation laboratory in Richmond, Calif. Dr. Kopjas and his family are living at the home of their sponsor, Dr. Thomas St. George, in El Cerrito, Calif.

AC

CANTON, MISS. — Charter of incorporation has been granted Southeastern Insecticide Corp., Canton, Miss., listing capital stock of $200,000.

AC

HERCULES POWDER CO., Wilmington, Del., has appointed Dr. John Paul Frawley of Washington, D. C., to fill the new post of toxicologist in the company's Medical Department.

AC

ARTHUR D. LITTLE, INC., Cambridge, Mass., will sponsor the second in its series of flavor symposia at the Parker House in Boston on Feb. 11.

AC

MISSISSIPPI CHEMICAL CORPORATION, Yazoo City, Miss., has advanced R. H. Fisackerly to general sales manager, succeeding W. F. Seat, who died recently.

Index to ADVERTISERS

Tale Ends

THIS is certainly the old "hot stove" season, not only in the baseball world but in the ag chemical field too. It's the season when the trades are being made, or plotted. This bright prospect is brought up from the minors; that one shipped out to the Piedmont League. Some of the industry's top executive personnel are involved in the old game of "musical chairs," and by the time the bugs start biting there are going to be some strange faces in old familiar spots.

AC

It's the season, too, when the top brass is sitting around discussing the unsatisfactory profit picture, and giving out with some rather strong suggestions on what might happen if the insecticide division doesn't begin to show a higher rate of return on the big chunks of dough invested in it. The season when the planning boards of some of our major units begin to wonder why they made this or that move a few years back, and whether they might be better off all around just to forget about the insecticide business altogether.

AC

Quite seriously the profit picture in the agricultural chemical field, particularly in insecticides, is not by any means what it should be, considering the tremendous investment involved and the high degree of risk. And even though 1956 was a big year, saleswise, profits were nothing to stand up and cheer about. The word we get is that some of the major factors in the industry are more convinced than ever, — for 1957—that a longer profit margin will have to be there,—or else.

AC

The big stakes required in the modern day pesticid: business are well illustrated by a current case in point. One of the major companies has a very promising new nematocide, which looks very good in trials to date. They are now faced with the question of whether they should gamble the three quarters of a million dollars required to go into commercial production. Only then will they know whether they have a money maker,—or another costly contribution to agricultural chemical progress. And they haven't yet made up their minds whether they care to gamble this very substantial investment.

AC

Those with their ears to the ground say that some big developments in antibiotics for agriculture are just about two years off. Serious testing of giberellic acid is in prospect for the coming season, and by '58 or '59 there may be a substantial field of use for this interesting new agricultural chemical tool.

AC

J. Lester Poucher who operates for Calspray out of Vidalia, Ga., raises Weimaraners in his spare moments. The first litter of Misty's Velvet Vixon, which he bred, is shown below, with the dam. Nine males of uniform size and color made their appearance just before Christmas. All have been placed with friends who hunt deer or quail. Mr. Poucher notes that another litter will be coming along next summer, and if any friends in the industry desire a top hunting dog, he will be pleased to take their appointment. Page Friar Thompson, or maybe the old Georgia squire got one out of the first litter.

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